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STATISTICAL SUMMARY OF MUNICIPAL WATER FACILITIES IN THE UNITED STATES, JANUARY 1, 1963

Richard S. Green

Public Health Service
Washington, D. C.

1965

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Statistical Summary of

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MUNICIPAL WATER FACILITIES in the United States January 1, 1963

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Division of Water Supply and Pollution Control
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FOREWORD

This report summarizes and analyzes data on community water supply and treatment facilities, based on the 1963 Inventory of Municipal Water Facilities. This is the fourth such study prepared by the Public Health Service. Comprehensive data are presented by States, community population size groups, and major drainage basins. For analytical and comparative purposes certain statistical data have been reproduced from the 1958 study.

The great volume of data represented in a publication such as this had to pass through the hands of many people. The basic material from which this summary was made was furnished by the State agencies concerned with municipal water facilities. Our gratitude is extended to the staffs of these State agencies for the review and revision of the data, without which none of this would be possible. The information was assembled by Public Health Service members of the HEW Regional Offices, and prepared for publication by staff members of the Basic Data Branch.

While we did not encounter the extent of difficulty reported by M. N. Baker in his inventory of 1891 (page 63 herein) we believe the benefits of the collection and publication of this information which he pointed out three-quarters of a century ago prevail today to an even greater extent.

RICHARD S. GREEN, *Chief*
Basic Data Branch
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INTRODUCTION

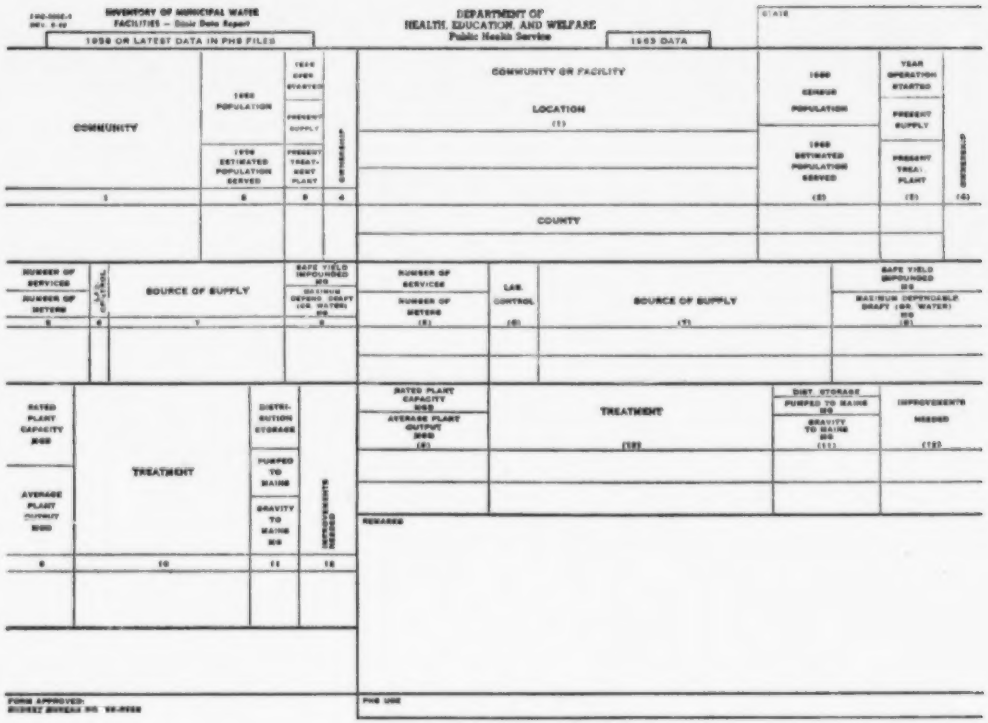
In 1939 the Public Health Service, in cooperation with the State health departments, initiated a comprehensive program for the compilation of water and sewage facilities statistics. Until 1950 this activity was conducted at what is now the Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, and was then transferred to the Division of Water Supply and Pollution Control, Washington, D.C. (*1*, *2*, *3*, *4*).

In 1943 untreated water supplies were added to the tabulations supplementing the earlier data. This tabulation was published in 1948 (*5*). Annual revisions were prepared for 1947 and 1948, but were not published.

A summary of the 1940 inventory data on water treatment plants was published (*4*) and data on all public water supplies were compiled by *Engineering News-Record* in 1939 (*6*).

Over the years, separate listings were developed, one for water supply facilities, the other for sewage and industrial waste facilities. Beginning in 1952 these data were requested from the respective State agencies responsible for water pollution control activities. Many States have themselves produced annual revisions of the inventory, beginning in 1953. The sewage services listings for the entire United States became available in 1957 and the water facilities listings in 1958.

Late in 1962, the Public Health Service sent all available descriptive and quantitative data for all water systems to the appropriate agencies of the respective States. The latest data then on file in the Washington office of the Public Health Service (usually that shown in the 1958 Inventory of Municipal Water Facilities) were entered at the left of the special report forms (see figure 1) sent to the States. State representatives were requested to review the data and to delete, add to, or revise to reflect conditions, capacities, and processes in use on January 1, 1963. They were asked to enter new or revised data on the right hand side of the report form and return it to the Basic Data Branch, Division of Water Supply and Pollution Control. When received in the Washington office, the data were edited and corrected, where necessary, to conform to established criteria and space allowances. Code numbers were then assigned to the various elements of the data preparatory to punching the data into automatic data processing cards. The punchcard information was subsequently read onto magnetic tapes which became the input medium for electronic computers which produced the data listings for the nine volumes of the 1963 Inventory of Municipal Water Facilities (*1*) and the tables in this volume.



INVENTORY OF MUNICIPAL WATER FACILITIES — Basic Data Report

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service

STATE

1958 OR LATEST DATA IN PHS FILES

1963 DATA

COMMUNITY	1958 POPULATION: 1958 ESTIMATED POPULATION SERVED	YEAR OPER. STARTED: PRESENT SUPPLY	YEAR OPER. STARTED: PRESENT TREAT. PLANT	CHANGED
1	5	9	4	

COMMUNITY OR FACILITY LOCATION (1)	1960 CENSUS POPULATION: 1963 ESTIMATED POPULATION SERVED (2)	YEAR OPER. STARTED: PRESENT SUPPLY (3)	YEAR OPER. STARTED: PRESENT TREAT. PLANT (3)	CHANGED (4)
COUNTY				

NUMBER OF SERVICES / NUMBER OF METERS	LAB. CONTROL	SOURCE OF SUPPLY	SAFE YIELD IMPOUNDED MG / MAXIMUM DEPENDABLE DRAFT (NO WATER) MG
6	6	7	8

NUMBER OF SERVICES / NUMBER OF METERS (5)	LAB. CONTROL (6)	SOURCE OF SUPPLY (7)	SAFE YIELD IMPOUNDED MG / MAXIMUM DEPENDABLE DRAFT (NO WATER) MG (8)

RATED PLANT CAPACITY MGD / AVERAGE PLANT OUTPUT MGD	TREATMENT	DISTRIBUTION STORAGE: PUMPED TO MAINS	DISTRIBUTION STORAGE: GRAVITY TO MAINS MG	IMPROVEMENTS NEEDED
9	10	11		12

RATED PLANT CAPACITY MGD / AVERAGE PLANT OUTPUT MGD (9)	TREATMENT (10)	DIST. STORAGE: PUMPED TO MAINS MG	DIST. STORAGE: GRAVITY TO MAINS MG (11)	IMPROVEMENTS NEEDED (12)

REMARKS

FORM APPROVED: BUREAU OF THE BUDGET NO. 68-R588

PHS USE

FIGURE 1.—*PHS Form 2226–1.*

BASIC DATA

Methods

This summary is based on the data contained in the 1963 Inventory of Municipal Water Facilities. The term "*municipal*," as used here, includes not only incorporated and unincorporated communities, but also privately owned companies, water districts in their many forms and terminologies, and such places as mill villages where there is a permanent resident population engaged in the normal domestic pattern of living.

For purposes of this summary, the terms "community" and "facility" are used and are defined as follows:

A *community* is a political or geographic entity having a water supply to which a census-type population can be assigned. It is a water-using entity and may be served by one or more water-producing facilities. A community as used here is a recognized grouping of homes to which a population figure can be assigned. A water district as such is not considered a community, but a community and a water district may be geographically synonymous.

A *facility* is a water-producing entity. It may be a community, a water district, or a corporation. The "population served" associated with it may include more than one community. There may be more than one facility in a community. Where water treatment is involved the terms "facility" and "plant" are used interchangeably.

The basic tabular data are shown here in three major classifications: Population size groups, States, and major drainage basins. There are however, many other detailed tables on file, showing data for each State by population size group and major-minor drainage basins.

In conformity with the other summaries, population size groups are divided as follows:

Group	*Population range*
1	Under 500
2	500–1,000
3	1,000–5,000
4	5,000–10,000
5	10,000–25,000
6	25,000–50,000
7	50,000–100,000
8	100,000 and over

Individual entries were assigned to a particular population group on the basis of the 1960 population census of the community. For unincorporated and certain other communities where the population census was not available, data from the 1960 Rand McNally Atlas were used. Where such information was still lacking, the estimated population served was used. Special water and other districts were put into the group using the estimated population served, as no census figure was applicable. Where the estimated populations served were not available from the inventory, the 1960 census populations, rounded to the nearest 5, were used.

Following passage of the Water Pollution Control Act of 1948, the United States was divided into major drainage basins. These basins have been used in this report and are as follows:*

Northeast	Missouri River
North Atlantic	Southwest-Lower Mississippi
Southeast	Colorado River
Tennessee River	Western Gulf
Ohio River	Pacific Northwest
Lake Erie	California
Upper Mississippi	Great Basin
Western Great Lakes	

Figure 2 delineates these major drainage basins in the 48 conterminous United States. These basins are further broken down into 246 minor basins, but are not used in this report. Summary information concerning each of these minor basins is on file at the Washington Headquarters of the Public Health Service's Division of Water Supply and Pollution Control.

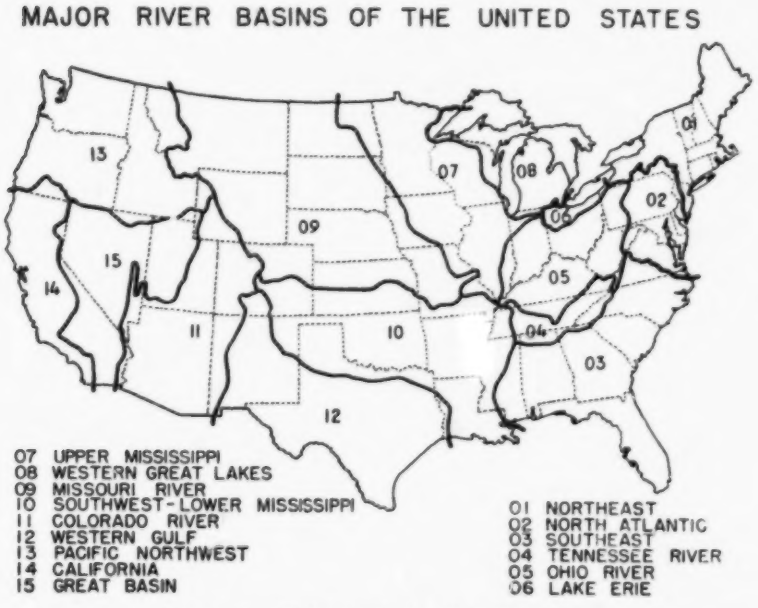


FIGURE 2.—*Major river basins of the United States.*

As in the 1958 summary, only regularly used water supplies are included in this summary. Seasonal, auxiliary and emergency supplies and/or treatment works are not included.

*Alaska, Hawaii, Puerto Rico, and the Virgin Islands have been arbitrarily assigned each to itself as a major basin.

Percentages are based on the total of the available data in the category under consideration. The tables which represent percentage changes were computed in accordance with the basic formula:

$$\% \text{ change} = \frac{\text{Data for later year minus data for earlier year}}{\text{Data for earlier year}} \times 100$$

Tabular Data

All basic data in this summary are presented in the first 13 tables. The remainder are comparative or analytical tables. Tables 1 through 4 contain total U.S. data on source of supply and treatment, treatment plants, type of disinfection, and frequently used water treatment processes.

Tables 5 through 13 contain detailed data based on the facility concept rather than the community concept and arranged by States, population groups, and major drainage basins. The reason for using the facility concept is twofold:

1. A more realistic interpretation of the data is obtained, in that in a community having two facilities of ground and surface sources it is possible statistically to separate ground from surface water. The same is true with treated and untreated water. Inevitably, however, there are some instances when these breakdowns cannot be made.

2. The summary will be in line with similar summaries for larger cities published since 1958.

Tables 5 through 10 contain various data on number of facilities and population served categorized as to source, treatment status, and ownership. Where necessary, data in tables 6 through 10 have been repeated to give comparative information, and to furnish all the data without reference to a previous table.

Table 11 shows data on the number of plants and population served by the functional classes of treatment. "Treatment" in this summary means any action taken upon the water—even so small an item as simple aeration. These classes are as follows: Purification, softening, iron and manganese removal, singly or in any combination; disinfection only or disinfection with miscellaneous treatment, and miscellaneous. These are used as basic classifications in the Inventory, and represent a description of the general function for which the plant was designed. In general, a plant was not classified as a "purification plant" unless some type of filter was used, although in some instances filters were used in categories not classified as purification.

Disinfection is examined as a separate unit process, and data relative to the various methods are summarized in table 12. Table 13 contains detailed data on number of plants and population served and categorized as to the unit processes such as gravity sand filtration (both rapid and slow), pressure sand filtration, anthrafilt, softening, aeration, taste and odor control, and corrosion control.

793-084—65——2

TABLE 1. *General waterworks summary for the United States—by facilities, facility ownership and population served*

	Number	Percent
Facilities—total	19,236	100.0
Serving surface water	3,432	17.8
Serving ground water	14,902	77.5
Serving both surface and ground water	902	4.7
Serving treated water	11,426	59.4
Serving untreated water	7,646	39.7
Serving both treated and untreated water	164	.9
Facility ownership—total	[1] 19,006	100.0
Public	13,468	70.9
Private	5,501	28.9
Both public and private	37	.2
Not stated	230	.....
Estimated population served—total	150,602,164	100.0
From surface sources	81,748,395	54.3
From ground sources	49,472,559	32.8
From both surface and ground sources	19,381,210	12.9
By treated supplies	137,060,323	91.0
By untreated supplies	12,309,991	8.2
By both treated and untreated supplies	1,231,850	.8

[1] Excludes not stated.

TABLE 2. *Summary of treatment plants for the United States classified by plant function*

Plant classification	Number of plants	Estimated population served	Number of plants	Estimated population served
			Percent of total	*Percent of total*
Purification (only)	2,369	56,943,070	20.5	41.2
Purification and softening	267	13,358,885	2.3	9.7
Purification and iron and manganese removal	75	1,148,050	.6	.8
Purification, softening and iron and manganese removal	49	1,521,755	.4	1.1
Softening	350	2,533,370	3.0	1.8
Iron and manganese removal	1,135	5,679,970	9.8	4.1
Softening and iron and manganese removal	371	2,845,510	3.2	2.1
Chlorination				
Simple	4,851	31,808,734	41.9	23.0
With some miscellaneous process	1,533	20,456,889	13.2	14.8
Miscellaneous	590	1,995,940	5.1	1.4
Total	11,590	138,292,173	100.0	100.0

TABLE 3. *Summary of waterworks disinfection practice for the United States classified by type of disinfecting agent*

Type of disinfection	Number of plants	Estimated population served	Number of plants	Estimated population served
			Percent of total	*Percent of total*
Liquid chlorine	5,929	101,677,063	57.0	75.8
Hypochlorite	3,873	6,109,885	37.2	4.6
Ammonia-chlorine	308	23,010,590	3.0	17.2
Both liquid chlorine and hypochlorite	202	1,916,240	1.9	1.4
Chlorine dioxide	8	535,205	.1	.4
Ozone	1	1,500	.1	<.1
Other	32	308,915	.3	.2
Agent not stated	57	697,010	.5	.4
Total*	10,405	134,067,528	100.0	100.0

*Not additive because more than one agent could be used.

TABLE 4. *Summary of some water treatment processes used in the United States*

	Number of plants using process*	Estimated population served
Filters:		
Rapid—sand	2,738	70,203,885
Slow—sand	184	3,950,875
Pressure	1,027	4,551,175
Rapid—(anthracite)	398	8,139,495
Softening:		
Lime—soda	358	10,296,465
Zeolite	486	4,343,630
Aeration	2,580	21,857,405
Taste and odor control	1,199	48,476,745
Corrosion control	2,600	48,082,210

*Plants using more than one process are included in total of each process.

TABLE 5. *General summary of facilities and population served by type of ownership*

Population size groups, States, and drainage basins	Total		Public		Private		Public and private		Not stated	
	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served
POPULATION SIZE GROUPS										
Under 500	5,433	1,724,981	3,245	1,127,491	2,078	564,720	11	3,545	99	29,225
500–1,000	3,751	2,901,512	2,762	2,195,468	922	644,004	11	8,900	56	53,140
1,000–5,000	6,054	14,269,131	4,692	11,636,921	1,315	2,545,255	10	23,855	37	62,100
5,000–10,000	1,503	10,150,890	1,113	8,595,635	372	1,471,450	2	16,510	16	67,295
10,000–25,000	1,225	16,707,415	876	13,768,010	340	2,812,050	2	36,620	7	90,735
25,000–50,000	573	14,791,775	362	12,283,770	204	2,384,570	1	41,000	6	82,435
50,000–100,000	298	12,900,250	173	10,405,000	123	2,411,750			2	83,500
Over 100,000	399	77,156,210	245	67,843,060	147	8,646,280			7	666,870
STATES										
Alabama	297	2,230,935	218	1,995,840	56	210,155	1	500	22	24,440
Alaska	39	86,585	33	81,585	6	5,000				
Arizona	224	1,382,815	59	1,061,005	161	314,260			4	7,550
Arkansas	232	1,065,300	194	934,965	36	129,370			2	965
California	1,690	17,508,320	567	13,505,680	1,087	3,627,420			36	375,220
Colorado	314	1,555,225	264	1,469,605	39	81,290			11	4,330
Connecticut	155	2,193,805	46	1,030,895	107	1,086,565			2	76,345
Delaware	41	409,845	28	231,020	13	178,825				
District of Columbia	2	1,092,870	2	1,092,870						
Florida	467	3,890,990	207	3,448,730	256	437,835			4	4,425
Georgia	419	2,796,250	356	2,752,010	61	42,640			2	1,600
Hawaii	83	594,075	44	198,485	33	47,535	4	11,630	2	336,425
Idaho	192	450,069	153	343,464	36	105,255	3	1,350		
Illinois	913	8,857,430	733	7,749,320	166	1,020,990	1	41,000	13	46,120
Indiana	394	3,196,060	319	1,845,600	64	1,339,655	1	2,500	10	8,305
Iowa	708	1,896,720	692	1,749,055	16	147,665				
Kansas	488	1,627,985	471	1,550,765	15	76,365			2	855
Kentucky	273	1,806,993	170	1,509,213	91	258,855	6	36,295	6	2,630
Louisiana	280	2,539,795	181	2,080,490	96	453,375	2	4,780	1	1,150
Maine	159	769,620	78	577,010	81	192,610				
Maryland	169	2,574,085	84	2,503,075	84	68,710			1	2,300
Massachusetts	275	5,061,435	221	4,845,365	44	183,090			10	32,980
Michigan	506	6,442,370	442	6,369,210	58	68,945			6	4,215
Minnesota	603	2,432,330	556	2,262,305	45	169,430			2	595
Mississippi	234	981,595	216	967,975	13	9,990	4	1,970	1	1,660
Missouri	430	3,530,365	391	2,283,740	36	1,244,610	1	950	2	1,065
Montana	165	474,505	123	358,175	37	115,145			5	1,185
Nebraska	431	1,040,735	431	1,040,735						
Nevada	57	287,345	28	158,460	27	127,630			2	1,255
New Hampshire	117	488,230	94	422,090	22	66,060			1	80

New Jersey	413	5,604,460	185	3,581,850	227	2,022,310			1	360
New Mexico	252	713,830	211	626,335	38	86,595	2	850	1	50
New York	1,014	15,653,155	632	14,307,280	371	1,334,970			11	10,905
North Carolina	367	2,292,380	298	2,152,475	68	138,905			1	1,000
North Dakota	178	370,760	177	370,660	1	100				
Ohio	546	7,798,245	516	7,532,235	29	265,210			1	800
Oklahoma	397	1,865,160	358	1,844,710	37	19,950			2	500
Oregon	353	1,373,120	254	1,260,055	94	107,415			5	5,650
Pennsylvania	959	9,856,291	465	6,317,316	493	3,538,725			1	250
Puerto Rico	70	1,643,555	68	1,627,350					2	16,205
Rhode Island	47	816,130	27	757,005	20	59,125				
South Carolina	215	1,420,835	152	1,278,720	58	130,890			5	11,225
South Dakota	252	416,680	238	398,485	14	18,195				
Tennessee	277	2,423,290	232	2,111,915	39	294,575	1	685	5	16,115
Texas	1,160	8,619,510	850	8,364,370	305	219,690			5	35,450
Utah	298	1,001,550	204	913,505	86	73,455	3	1,800	5	22,790
Vermont	185	255,959	91	233,265	94	22,694				
Virginia	508	2,590,670	205	2,087,560	300	501,110	1	400	2	1,600
Virgin Islands	3	23,390	3	23,390						
Washington	463	2,427,992	328	2,303,022	125	121,590	3	950	7	2,430
West Virginia	394	1,171,305	112	547,815	276	616,360			6	7,130
Wisconsin	426	2,750,140	386	2,595,710	18	86,345			22	68,085
Wyoming	102	249,075	75	201,590	22	22,595	4	24,770	1	120
Major Drainage Basins										
Northeast	2,019	29,246,119	1,182	24,545,410	813	4,580,399			24	120,310
North Atlantic	1,458	13,705,390	702	10,634,275	752	3,066,765			4	4,350
Southeast	1,907	13,114,875	1,305	12,077,735	565	992,905	3	1,775	34	42,460
Tennessee River	299	1,684,435	228	1,379,675	67	289,165			4	15,595
Ohio River	1,908	13,932,444	1,236	9,972,294	640	3,904,775	7	35,410	25	19,965
Lake Erie	189	4,142,685	174	4,036,295	15	106,390				
Upper Mississippi	2,347	14,977,205	2,083	12,750,710	234	2,120,860	1	41,000	29	64,635
Western Great Lakes	710	9,496,010	646	9,107,335	80	334,345			14	54,330
Missouri River	1,830	5,829,085	1,737	5,432,980	83	372,105	2	21,240	8	2,760
Southwest-Lower Mississippi	1,660	8,686,675	1,429	7,912,510	241	755,595	7	10,895	13	7,675
Colorado River	467	1,808,815	225	1,439,675	229	356,375	3	4,030	10	8,735
Western Gulf	1,223	8,635,665	903	8,294,615	313	305,200	1	350	6	35,500
Pacific Northwest	1,026	4,354,216	737	3,925,476	270	418,310	6	2,300	13	8,130
California	1,513	17,203,265	514	13,331,295	969	3,499,100			30	372,870
Great Basin	455	1,437,675	249	1,084,265	191	325,255	3	1,800	12	26,355
Alaska	39	86,585	33	81,585	6	5,000				
Hawaii	83	594,075	44	198,485	33	47,535	4	11,630	2	336,425
Puerto Rico	70	1,643,555	68	1,627,350					2	16,205
Virgin Islands	3	23,390	3	23,390						
Total*	19,236	150,602,164	13,468	127,855,355	5,501	21,480,079	37	130,430	230	1,136,300

*Denotes total for each major division, population groups, States, and major drainage basins.

TABLE 6. *Source of water supply for number of facilities and population served—arranged by population groups, States, and drainage basins*

Population groups, States, and drainage basins	Total		Surface		Ground		Surface and ground	
	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served
POPULATION GROUPS								
Under 500	5,433	1,724,981	597	212,860	4,723	1,450,841	113	61,280
500–1,000	3,751	2,901,512	493	463,970	3,136	2,330,493	122	107,049
1,000–5,000	6,054	14,269,131	1,170	3,523,275	4,544	9,781,655	340	964,201
5,000–10,000	1,503	10,150,890	383	3,223,155	1,004	5,941,550	116	986,185
10,000–25,000	1,225	16,707,415	346	6,157,135	762	8,724,160	117	1,826,120
25,000–50,000	573	14,791,775	166	6,183,650	348	6,489,940	59	2,118,185
50,000–100,000	298	12,900,250	109	7,609,475	175	4,296,040	14	994,735
Over 100,000	399	77,156,210	168	54,374,875	210	10,457,880	21	12,323,455
STATES								
Alabama	297	2,230,935	69	1,305,670	221	816,965	7	108,300
Alaska	39	86,585	25	38,865	11	44,710	3	3,010
Arizona	224	1,382,815	9	301,460	209	1,048,905	6	32,450
Arkansas	232	1,065,300	46	491,910	182	477,840	4	95,550
California	1,690	17,508,320	226	9,133,320	1,349	7,244,820	115	1,130,180
Colorado	314	1,555,225	92	985,795	196	305,190	26	264,240
Connecticut	155	2,193,805	53	1,509,505	76	199,140	26	485,160
Delaware	41	409,845	5	193,100	36	216,745	.....	.....
District of Columbia	2	1,092,870	2	1,092,870	.....	.....	.....	.....
Florida	467	3,890,990	16	491,470	450	3,398,120	1	1,400
Georgia	419	2,796,250	80	1,943,490	327	790,390	12	62,370
Hawaii	83	594,075	20	26,130	56	540,955	7	26,990
Idaho	192	450,069	32	53,550	147	297,349	13	99,170
Illinois	913	8,857,430	118	6,150,830	786	2,568,355	9	138,245
Indiana	394	3,196,060	48	1,496,425	335	1,509,375	11	190,260
Iowa	708	1,896,720	33	336,375	666	1,160,415	9	399,930
Kansas	488	1,627,985	73	444,780	400	945,410	15	237,795
Kentucky	273	1,806,993	130	1,475,090	123	289,283	20	42,620
Louisiana	280	2,539,795	43	1,504,115	236	1,035,455	1	225
Maine	159	769,620	74	534,760	65	103,070	20	131,790
Maryland	169	2,574,085	29	2,229,260	131	317,975	9	26,850
Massachusetts	275	5,061,435	54	3,250,405	168	1,019,225	53	791,805
Michigan	506	6,442,370	77	5,105,810	423	1,222,730	6	113,830
Minnesota	603	2,432,330	23	1,161,060	578	1,247,960	2	23,310
Mississippi	234	981,595	3	215,770	230	715,825	1	50,000
Missouri	430	3,530,365	87	2,818,265	341	681,900	2	30,200
Montana	165	474,505	31	224,235	114	114,505	20	135,765
Nebraska	431	1,040,735	3	372,375	427	667,700	1	660
Nevada	57	287,345	9	72,260	43	107,840	5	107,245
New Hampshire	117	488,230	50	243,150	52	103,665	15	141,415

New Jersey	413	5,604,460	25	2,472,895	367	2,204,625	21	926,940
New Mexico	252	713,830	14	51,560	233	586,020	5	76,250
New York	1,014	15,653,155	296	4,446,380	653	3,129,030	65	8,077,745
North Carolina	367	2,292,380	143	1,881,625	217	385,155	7	25,600
North Dakota	178	370,760	14	162,960	156	152,200	8	55,600
Ohio	546	7,798,245	126	5,536,920	403	2,001,485	17	259,840
Oklahoma	397	1,865,160	93	901,850	290	545,650	14	417,660
Oregon	353	1,373,120	123	957,495	197	269,445	33	146,180
Pennsylvania	959	9,856,291	273	7,725,330	549	1,255,325	137	875,636
Puerto Rico	70	1,643,555	42	1,184,070	27	453,335	1	6,159
Rhode Island	47	816,130	8	498,210	35	186,210	4	131,710
South Carolina	215	1,420,835	63	1,024,080	148	364,635	4	32,120
South Dakota	252	416,680	11	89,410	237	292,345	4	34,925
Tennessee	277	2,423,290	56	1,133,655	200	1,100,175	21	189,460
Texas	1,160	8,619,510	172	2,851,110	960	3,693,560	28	2,074,840
Utah	298	1,001,550	32	268,635	249	497,765	17	235,150
Vermont	185	255,959	41	147,630	116	49,680	28	58,649
Virginia	508	2,590,670	88	1,838,285	402	368,245	18	384,140
Virgin Islands	3	23,390	1	15,255	2	8,135		
Washington	463	2,427,992	82	1,126,955	353	977,537	28	323,500
West Virginia	394	1,171,305	121	720,065	257	365,580	16	85,660
Wisconsin	426	2,750,140	21	1,453,355	404	1,286,785	1	10,000
Wyoming	102	249,075	27	58,565	69	107,820	6	82,690
Major Drainage Basins								
Northeast	2,019	29,246,119	565	12,701,015	1,243	5,948,580	211	10,596,524
North Atlantic	1,458	13,705,390	269	10,026,915	1,042	2,466,565	147	1,211,910
Southeast	1,907	13,114,875	355	6,723,795	1,521	6,104,010	31	287,070
Tennessee River	299	1,684,435	88	1,018,465	190	513,710	21	152,260
Ohio River	1,908	13,932,444	534	8,782,750	1,277	4,347,633	97	802,061
Lake Erie	189	4,142,685	64	3,792,125	120	299,725	5	50,835
Upper Mississippi	2,347	14,977,205	146	8,819,575	2,179	5,582,595	22	575,035
Western Great Lakes	710	9,496,010	117	7,428,225	584	1,941,770	9	126,015
Missouri River	1,830	5,829,085	205	2,805,350	1,578	2,400,475	47	623,260
Southwest-Lower Mississippi	1,690	8,686,675	271	3,624,530	1,383	4,442,055	36	620,090
Colorado River	467	1,308,815	83	514,905	365	1,227,955	19	65,955
Western Gulf	1,223	8,635,665	155	2,650,175	1,037	3,843,855	31	2,141,635
Pacific Northwest	1,026	4,354,216	246	2,190,690	698	1,523,551	82	639,975
California	1,513	17,203,265	195	9,074,095	1,214	7,074,765	104	1,054,405
Great Basin	455	1,437,675	51	331,465	375	708,180	29	398,030
Alaska	39	86,585	25	38,865	11	44,710	3	3,010
Hawaii	83	594,075	20	26,130	56	540,955	7	26,99
Puerto Rico	70	1,643,555	42	1,184,070	27	453,335	1	6,150
Virgin Islands	3	23,390	1	15,255	2	8,135		
Total*	19,236	150,602,164	3,432	81,748,395	14,902	49,472,559	902	19,381,210

*Denotes total for each major division, population size groups, States, and major drainage basins.

TABLE 7. *Treatment of water supply for number of facilities and population served—arranged by population groups, States, and drainage basins*

Population size groups, States, and drainage basins	Total		Treated		Untreated		Both	
	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served
POPULATION SIZE GROUPS								
Under 500	5,433	1,724,981	2,105	797,630	3,308	907,426	20	19,925
500–1,000	3,751	2,901,512	2,140	1,777,899	1,586	1,102,333	25	21,280
1,000–5,000	6,054	14,269,131	4,231	10,887,684	1,759	3,221,727	64	159,720
5,000–10,000	1,503	10,150,890	1,147	8,501,955	342	1,555,760	14	93,175
10,000–25,000	1,225	16,707,415	914	14,411,845	290	1,847,790	21	447,780
25,000–50,000	573	14,791,775	406	13,479,745	153	1,055,025	14	257,005
50,000–100,000	298	12,900,250	192	11,570,800	102	1,203,650	4	125,800
Over 100,000	399	77,156,210	291	75,632,765	106	1,416,280	2	107,165
STATES								
Alabama	297	2,230,935	263	2,102,675	32	92,460	2	35,800
Alaska	39	86,585	24	79,635	15	6,950		
Arizona	224	1,382,815	54	515,835	168	863,480	2	3,500
Arkansas	232	1,065,300	176	982,605	56	82,695		
California	1,690	17,508,320	488	12,973,750	1,169	4,109,845	33	424,725
Colorado	314	1,555,225	195	1,461,175	119	94,050		
Connecticut	155	2,193,805	103	2,082,330	47	98,465	5	13,010
Delaware	41	409,845	27	383,770	14	26,075		
District of Columbia	2	1,092,870	2	1,092,870				
Florida	467	3,890,990	357	3,696,315	105	128,875	5	65,800
Georgia	419	2,796,250	246	2,631,320	172	164,530	1	400
Hawaii	83	594,075	30	433,805	53	160,270		
Idaho	192	450,069	70	297,435	120	110,334	2	42,300
Illinois	913	8,857,430	701	8,605,825	212	251,605		
Indiana	394	3,196,060	353	2,972,330	41	223,730		
Iowa	709	1,896,720	429	1,701,680	272	171,285	7	20,755
Kansas	488	1,627,985	487	1,624,085	1	3,900		
Kentucky	273	1,806,993	237	1,790,355	36	16,638		
Louisiana	280	2,539,795	155	2,312,080	124	222,815	1	4,900
Maine	159	769,620	116	731,435	43	38,185		
Maryland	169	2,574,085	141	2,557,990	28	16,095		
Massachusetts	275	5,061,435	143	4,331,170	112	436,295	20	293,970
Michigan	506	6,442,370	221	6,058,840	285	383,530		
Minnesota	603	2,432,330	311	2,083,510	292	348,820		
Mississippi	234	981,595	127	837,190	107	144,405		
Missouri	430	3,530,365	239	3,339,770	191	190,595		
Montana	165	474,505	93	404,210	70	67,445	2	2,850
Nebraska	431	1,040,735	43	627,370	387	410,265	1	3,100
Nevada	57	287,345	26	187,595	31	99,750		
New Hampshire	117	488,230	69	411,380	41	48,735	7	28,115

New Jersey	113	5,604,360	299	5,270,835	105	246,275	9	87,350
New Mexico	252	713,830	101	576,920	151	136,910		
New York	1,014	15,653,155	614	15,299,605	390	291,555	10	61,995
North Carolina	367	2,292,380	237	2,146,125	129	145,055	1	1,200
North Dakota	178	370,760	72	302,855	104	65,705	2	2,200
Ohio	546	7,798,245	446	7,631,760	100	166,485		
Oklahoma	397	1,865,160	247	1,701,545	150	163,615		
Oregon	353	1,373,120	208	1,258,140	138	109,150	7	5,830
Pennsylvania	959	9,856,291	830	9,781,549	129	74,742		
Puerto Rico	70	1,643,555	70	1,643,555				
Rhode Island	47	816,130	31	782,000	16	34,130		
South Carolina	215	1,420,835	116	1,268,520	99	152,315		
South Dakota	252	416,680	89	337,920	148	61,000	15	17,760
Tennessee	277	2,423,290	254	2,398,260	23	25,030		
Texas	1,160	8,619,510	717	8,063,340	443	556,170		
Utah	298	1,001,550	100	813,200	198	188,350		
Vermont	185	255,959	55	192,954	127	54,105	3	8,900
Virginia	508	2,590,670	251	2,424,590	248	158,725	9	7,355
Virgin Islands	3	23,390	3	23,390				
Washington	463	2,427,992	161	1,996,625	296	375,307	6	56,060
West Virginia	394	1,171,305	300	1,136,870	94	34,435		
Wisconsin	426	2,750,140	239	2,483,355	173	222,810	14	43,975
Wyoming	102	249,075	60	213,075	42	36,000		
Major Drainage Basins								
Northeast	2,019	29,246,119	1,226	27,676,989	744	1,080,415	49	488,715
North Atlantic	1,458	13,705,390	1,027	13,349,370	422	348,040	9	7,980
Southeast	1,907	13,114,875	1,252	12,173,975	643	834,300	12	106,600
Tennessee River	299	1,684,435	273	1,666,795	26	17,640		
Ohio River	1,908	13,932,444	1,595	13,613,699	311	318,145	2	600
Lake Erie	189	4,142,685	166	4,105,335	23	37,350		
Upper Mississippi	2,347	14,977,205	1,460	14,013,425	872	915,330	15	48,450
Western Great Lakes	710	9,496,010	357	8,868,740	349	619,325	4	7,945
Missouri River	1,830	5,829,085	892	5,002,530	916	794,310	22	34,245
Southwest-Lower Mississippi	1,690	8,686,675	1,108	8,034,070	581	641,705	1	4,900
Colorado River	467	1,808,815	171	817,885	294	987,430	2	3,500
Western Gulf	1,223	8,635,665	730	7,998,555	493	637,110		
Pacific Northwest	1,026	4,354,216	463	3,661,705	549	591,521	14	100,990
California	1,513	17,203,265	455	12,866,595	1,027	3,917,145	31	419,525
Great Basin	455	1,437,675	124	1,032,270	328	397,005	3	8,400
Alaska	39	86,585	24	79,635	15	6,950		
Hawaii	83	594,075	30	433,805	53	160,270		
Puerto Rico	70	1,643,555	70	1,643,555				
Virgin Islands	3	23,390	3	23,390				
Total*	19,236	150,602,164	11,426	137,060,323	7,645	12,309,991	164	1,231,850

*Denotes total for each major division, population groups, States, and major drainage basins.

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TABLE 8. *Treatment of surface water supplies—by number of facilities and estimated population served—arranged by population groups, States, and drainage basins*

Population size groups, States, and drainage basins	Total		Treated		Untreated		Both	
	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served
POPULATION SIZE GROUPS								
Under 500	597	212,860	458	174,545	139	38,315		
500–1,000	493	463,970	449	433,155	44	30,815		
1,000–5,000	1,170	3,523,275	1,147	3,490,755	23	32,520		
5,000–10,000	383	3,223,155	382	3,219,905	1	3,250		
10,000–25,000	346	6,157,135	346	6,157,135				
25,000–50,000	166	6,183,650	163	6,122,955	3	60,695		
50,000–100,000	109	7,609,475	108	7,609,180	1	295		
Over 100,000	168	54,374,875	168	54,374,875				
STATES								
Alabama	69	1,305,670	69	1,305,670				
Alaska	25	38,865	13	33,850	12	5,015		
Arizona	9	301,460	9	301,460				
Arkansas	46	491,910	46	491,910				
California	226	9,133,320	176	9,073,325	50	59,995		
Colorado	92	985,795	77	975,155	15	10,640		
Connecticut	53	1,509,505	51	1,492,035	2	17,470		
Delaware	5	193,100	5	193,100				
District of Columbia	2	1,092,870	2	1,092,870				
Florida	16	491,470	16	491,470				
Georgia	80	1,913,490	79	1,941,860	1	1,630		
Hawaii	20	26,130	10	14,970	10	11,160		
Idaho	32	53,550	22	47,200	10	6,350		
Illinois	118	6,150,830	118	6,150,830				
Indiana	48	1,496,425	48	1,496,425				
Iowa	33	336,375	33	336,375				
Kansas	73	444,780	73	444,780				
Kentucky	130	1,475,090	127	1,473,590	3	1,500		
Louisiana	43	1,504,115	43	1,504,115				
Maine	74	534,760	70	532,705	4	2,055		
Maryland	29	2,229,260	26	2,228,920	3	340		
Massachusetts	54	3,250,405	48	3,243,485	6	6,920		
Michigan	77	5,105,810	77	5,105,810				
Minnesota	23	1,161,060	23	1,161,060				
Mississippi	3	215,770	3	215,770				
Missouri	87	2,818,265	87	2,818,265				
Montana	31	224,235	29	224,045	2	190		
Nebraska	3	372,375	3	372,375				
Nevada	9	72,260	9	72,260				
New Hampshire	50	243,150	47	242,200	3	950		

New Jersey	25	2,472,895	25	2,472,895				
New Mexico	14	51,560	14	51,560				
New York	296	4,446,380	275	4,436,005	21	10,375		
North Carolina	143	1,881,625	143	1,881,625				
North Dakota	14	162,960	14	162,960				
Ohio	126	5,536,920	126	5,536,920				
Oklahoma	93	901,850	93	901,850				
Oregon	123	957,495	118	956,885	5	610		
Pennsylvania	273	7,725,330	269	7,724,720	4	610		
Puerto Rico	42	1,184,070	42	1,184,070				
Rhode Island	8	498,210	8	498,210				
South Carolina	63	1,024,080	63	1,024,080				
South Dakota	11	89,410	11	89,410				
Tennessee	56	1,133,655	56	1,133,655				
Texas	172	2,851,110	166	2,846,620	6	4,490		
Utah	32	268,635	21	263,010	11	5,625		
Vermont	41	147,630	30	141,090	11	6,540		
Virginia	88	1,838,285	82	1,835,420	6	2,865		
Virgin Islands	1	15,255	1	15,255				
Washington	82	1,126,955	65	1,120,300	17	6,655		
West Virginia	121	720,065	114	717,075	7	2,990		
Wisconsin	21	1,453,355	21	1,453,355				
Wyoming	27	58,565	25	57,650	2	915		
Major Drainage Basins								
Northeast	565	12,701,015	520	12,657,905	45	43,110		
North Atlantic	269	10,026,915	258	10,023,990	11	2,925		
Southeast	355	6,723,795	352	6,720,370	3	3,425		
Tennessee River	88	1,018,465	87	1,018,265	1	200		
Ohio River	534	8,782,750	523	8,778,165	11	4,585		
Lake Erie	64	3,792,125	64	3,792,125				
Upper Mississippi	146	8,819,575	146	8,819,575				
Western Great Lakes	117	7,428,225	117	7,428,225				
Missouri River	205	2,805,350	201	2,801,615	4	3,735		
Southwest-Lower Mississippi	271	3,624,530	267	3,622,920	4	1,610		
Colorado River	83	514,905	65	504,520	18	10,385		
Western Gulf	155	2,650,175	151	2,646,425	4	3,750		
Pacific Northwest	246	2,190,690	214	2,179,885	32	10,805		
California	195	9,074,095	157	9,018,020	38	56,075		
Great Basin	51	331,465	33	322,355	18	9,110		
Alaska	25	38,865	13	33,850	12	5,015		
Hawaii	20	26,130	10	14,970	10	11,160		
Puerto Rico	42	1,184,070	42	1,184,070				
Virgin Islands	1	15,255	1	15,255				
Total*	3,432	81,748,395	3,221	81,582,505	211	165,890		

*Denotes total for each major division, population groups, States, and major drainage basins.

TABLE 9. *Treatment of ground water supplies—by number of facilities and estimated population served—arranged by population groups, States and drainage basins*

Population size groups, States, and drainage basins	Total		Treated		Untreated		Both	
	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served
POPULATION SIZE GROUPS								
Under 500	4,723	1,450,841	1,581	584,555	3,128	850,986	14	15,300
500–1,000	3,136	2,330,493	1,587	1,252,875	1,528	1,060,138	21	17,480
1,000–5,000	4,544	9,781,655	2,779	6,515,745	1,717	3,145,435	48	120,475
5,000–10,000	1,004	5,941,550	662	4,383,235	335	1,510,960	7	48,255
10,000–25,000	762	8,724,160	466	6,678,790	286	1,821,740	10	223,630
25,000–50,000	348	6,489,940	190	5,412,205	150	994,330	8	83,405
50,000–100,000	175	4,296,040	70	2,966,885	101	1,203,355	4	125,800
Over 100,000	210	10,457,880	102	8,934,435	106	1,416,280	2	107,165
STATES								
Alabama	221	816,965	187	688,705	32	92,460	2	35,800
Alaska	11	44,710	9	43,170	2	1,540		
Arizona	209	1,048,905	11	206,925	166	838,480	2	3,500
Arkansas	182	477,840	126	395,145	56	82,695		
California	1,349	7,244,820	220	2,868,320	1,107	4,036,845	22	339,655
Colorado	196	305,190	98	223,410	98	81,780		
Connecticut	76	199,140	30	116,045	44	78,195	2	4,900
Delaware	36	216,745	22	190,670	14	26,075		
District of Columbia								
Florida	450	3,398,120	340	3,203,445	105	128,875	5	65,800
Georgia	327	790,390	155	627,090	171	162,900	1	400
Hawaii	56	540,955	15	394,820	38	146,135		
Idaho	147	297,349	40	192,425	106	101,724	1	3,200
Illinois	786	2,568,355	575	2,323,750	211	244,605		
Indiana	335	1,509,375	294	1,285,645	41	223,730		
Iowa	666	1,160,415	387	968,375	272	171,285	7	20,755
Kansas	400	945,410	399	941,510	1	3,900		
Kentucky	123	289,283	92	275,205	31	14,078		
Louisiana	236	1,035,455	112	807,965	123	222,590	1	4,900
Maine	65	103,070	26	66,940	39	36,130		
Maryland	131	317,975	106	302,220	25	15,755		
Massachusetts	168	1,019,225	63	551,475	101	414,075	4	53,675
Michigan	423	1,222,730	138	839,200	285	383,530		
Minnesota	578	1,247,960	287	899,515	291	348,445		
Mississippi	230	715,825	123	571,420	107	144,405		
Missouri	341	681,900	150	491,305	191	190,595		
Montana	114	114,505	45	44,500	67	67,155	2	2,850
Nebraska	427	667,700	39	254,335	387	410,265	1	3,100
Nevada	43	107,840	13	8,480	30	99,360		
New Hampshire	52	103,665	14	55,880	38	47,785		

New Jersey	367	2,204,625	255	1,917,000	105	246,275	7	41,350
New Mexico	233	586,020	82	449,110	151	136,910		
New York	653	3,129,030	279	2,789,885	366	278,450	8	60,695
North Carolina	247	385,155	87	238,900	129	145,055	1	1,200
North Dakota	156	152,200	50	84,295	104	65,705	2	2,200
Ohio	303	2,001,485	303	1,835,000	100	166,485		
Oklahoma	290	545,650	141	382,175	149	163,475		
Oregon	197	269,445	63	174,620	128	89,095	6	5,730
Pennsylvania	549	1,255,325	428	1,184,410	121	70,915		
Puerto Rico	27	453,335	27	453,335				
Rhode Island	35	186,210	19	152,080	16	34,130		
South Carolina	148	364,635	49	212,320	99	152,315		
South Dakota	247	292,345	75	217,310	148	61,000	14	14,035
Tennessee	200	1,100,175	177	1,075,145	23	25,030		
Texas	960	3,693,560	524	3,142,180	436	551,380		
Utah	249	497,765	68	335,755	181	162,010		
Vermont	116	49,680	10	16,285	105	33,145	1	250
Virginia	402	368,245	152	206,030	242	155,860	8	6,355
Virgin Islands	2	8,135	2	8,135				
Washington	353	977,537	80	589,295	270	361,057	3	27,185
West Virginia	257	365,580	170	334,135	87	31,445		
Wisconsin	404	1,286,785	247	1,020,000	173	222,810	14	43,975
Wyoming	69	107,820	30	73,435	39	34,385		
Major Drainage Basins								
Northeast	1,243	5,948,580	546	4,789,780	679	1,002,055	18	156,745
North Atlantic	1,042	2,466,565	626	2,114,445	408	344,640	8	7,480
Southeast	1,521	6,104,010	870	5,167,535	640	830,875	11	105,600
Tennessee River	190	513,710	165	496,270	25	17,440		
Ohio River	1,277	4,347,633	978	4,037,275	297	309,758	2	600
Lake Erie	120	299,725	97	262,375	23	37,350		
Upper Mississippi	2,179	5,582,505	1,293	4,625,815	874	908,330	15	48,450
Western Great Lakes	584	1,941,770	232	1,314,875	348	618,950	4	7,945
Missouri River	1,578	2,400,475	650	1,580,695	907	789,260	21	30,520
Southwest-Lower Mississippi	1,383	4,442,055	807	3,791,425	575	645,730	1	4,900
Colorado River	365	1,227,955	92	273,825	271	950,630	2	3,500
Western Gulf	1,037	3,843,[illegible]	550	3,211,195	487	632,660		
Pacific Northwest	698	1,523,551	189	939,070	508	551,566	9	32,915
California	1,214	7,074,765	212	2,882,170	981	3,854,440	21	338,155
Great Basin	375	708,180	74	342,515	299	360,965	2	4,700
Alaska	11	44,710	9	43,170	2	1,540		
Hawaii	56	540,955	16	394,820	38	146,135		
Puerto Rico	27	453,335	27	453,335				
Virgin Islands	2	8,135	2	8,135				
Total*	14,902	49,472,559	7,437	36,728,725	7,351	12,002,324	114	741,510

*Denotes total for each major division, population groups, States, and major drainage basins.

TABLE 10. *Treatment of supply for number of facilities and estimated population served by both surface and ground sources—arranged by population groups, States, and drainage basins*

Population size groups, States, and drainage basins	Total		Treated		Untreated		Both	
	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served
Under 500	113	61,280	66	38,530	41	18,125	6	4,625
500–1,000	122	107,049	104	91,869	14	11,380	4	3,800
1,000–5,000	340	964,201	305	881,184	19	43,772	16	39,245
5,000–10,000	116	986,185	103	898,815	6	42,450	7	44,920
10,000–25,000	117	1,826,120	102	1,575,920	4	26,050	11	224,150
25,000–50,000	59	2,118,185	53	1,944,585			6	173,600
50,000–100,000	14	994,735	14	994,735				
Over 100,000	21	12,323,455	21	12,323,455				
STATES								
Alabama	7	108,300	7	108,300				
Alaska	3	3,010	2	2,615	1	395		
Arizona	6	32,450	4	7,450	2	25,000		
Arkansas	4	95,550	4	95,550				
California	115	1,130,180	92	1,032,105	12	13,005	11	85,070
Colorado	26	264,240	20	262,610	6	1,630		
Connecticut	26	485,160	22	474,250	1	2,800	3	8,110
Delaware								
District of Columbia								
Florida	1	1,400	1	1,400				
Georgia	12	62,370	12	62,370				
Hawaii	7	26,990	2	24,015	5	2,975		
Idaho	13	99,170	8	57,810	4	2,260	1	39,100
Illinois	9	138,245	8	131,245	1	7,000		
Indiana	11	190,260	11	190,260				
Iowa	9	399,930	9	399,930				
Kansas	15	237,795	15	237,795				
Kentucky	20	42,620	18	41,560	2	1,060		
Louisiana	1	225			1	225		
Maine	20	131,790	20	131,790				
Maryland	9	26,850	9	26,850				
Massachusetts	53	791,805	32	536,210	5	15,300	16	240,295
Michigan	6	113,830	6	113,830				
Minnesota	2	23,310	1	22,935	1	375		
Mississippi	1	50,000	1	50,000				
Missouri	2	30,200	2	30,200				
Montana	20	135,765	19	135,665	1	100		
Nebraska	1	660	1	660				
Nevada	5	107,245	4	106,855	1	390		
New Hampshire	15	141,415	8	113,300			7	28,115

New Jersey	21	926,940	19	880,940			2	46,000
New Mexico	5	76,250	5	76,250				
New York	65	8,077,745	60	8,073,715	3	2,730	2	1,300
North Carolina	7	25,600	7	25,600				
North Dakota	8	55,600	8	55,600				
Ohio	17	259,840	17	259,840				
Oklahoma	14	417,660	13	417,520	1	140		
Oregon	33	146,180	27	126,635	5	19,445	1	100
Pennsylvania	137	875,636	133	872,419	4	3,217		
Puerto Rico	1	6,150	1	6,150				
Rhode Island	4	131,710	4	131,710				
South Carolina	4	32,120	4	32,120				
South Dakota	4	34,925	3	31,200			1	3,725
Tennessee	21	189,460	21	189,460				
Texas	28	2,074,840	27	2,074,540	1	300		
Utah	17	235,150	11	214,435	6	20,715		
Vermont	28	58,649	15	35,579	11	14,420	2	8,650
Virginia	18	384,140	17	383,140			1	1,000
Virgin Islands								
Washington	28	323,590	16	287,030	9	7,595	3	28,875
West Virginia	16	85,660	16	85,660				
Wisconsin	1	10,000	1	10,000				
Wyoming	6	82,690	5	81,990	1	700		
Major Drainage Basins								
Northeast	211	10,596,524	160	10,229,304	20	35,250	31	331,970
North Atlantic	147	1,211,910	143	1,210,935	3	475	1	500
Southeast	31	287,070	30	286,070			1	1,000
Tennessee River	21	152,260	21	152,260				
Ohio River	97	802,061	94	798,259	3	3,802		
Lake Erie	5	50,835	5	50,835				
Upper Mississippi	22	575,035	21	568,035	1	7,000		
Western Great Lakes	9	126,015	8	125,640	1	375		
Missouri River	47	623,260	41	618,220	5	1,315	1	3,725
Southwest-Lower Mississippi	36	620,090	34	619,725	2	365		
Colorado River	19	65,955	14	39,540	5	26,415		
Western Gulf	31	2,141,635	29	2,140,935	2	700		
Pacific Northwest	82	639,975	60	542,750	17	29,150	5	68,075
California	104	1,054,405	86	966,405	8	6,630	10	81,370
Great Basin	29	398,030	17	367,400	11	26,930	1	3,700
Alaska	3	3,010	2	2,615	1	395		
Hawaii	7	26,990	2	24,015	5	2,975		
Puerto Rico	1	6,150	1	6,150				
Virgin Islands								
Total*	902	19,381,210	768	18,749,093	84	141,777	50	490,340

*Denotes total for each major division, population groups, States, and major drainage basins.

TABLE 11. *Number of plants and population served by various functional classes*

Population size groups, States, and major drainage basins	Total all plants		Purification only		Purification and softening	
	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served
POPULATION SIZE GROUPS						
Under 500	2,125	817,555	199	93,770	5	2,640
500–1,000	2,165	1,799,179	298	269,835	20	19,170
1,000–5,000	4,295	11,047,464	916	3,016,905	93	246,610
5,000–10,000	1,161	8,595,130	326	2,960,350	34	281,375
10,000–25,000	935	14,859,627	315	5,768,065	50	930,450
25,000–50,000	420	13,736,750	129	5,187,770	30	1,019,465
50,000–100,000	196	11,686,600	85	6,093,970	8	626,335
Over 100,000	293	75,739,950	124	33,642,405	27	10,242,840
STATES						
Alabama	265	2,138,475	79	1,335,670		
Alaska	24	29,635	2	10,115		
Arizona	56	549,335	10	311,560		
Arkansas	176	962,605	46	502,270	2	7,870
California	521	13,398,475	72	3,166,440	5	2,547,900
Colorado	195	1,461,175	56	991,605	3	6,880
Connecticut	108	2,495,340	21	869,405		
Delaware	27	383,770	9	201,205		
District of Columbia	2	1,092,870	2	1,092,870		
Florida	362	3,762,115	12	184,860	3	291,260
Georgia	247	2,631,720	83	1,896,980	2	39,500
Hawaii	30	433,595	8	10,600		
Idaho	72	399,735	5	54,820		
Illinois	704	8,605,825	110	3,219,950	14	170,550
Indiana	353	2,972,350	50	1,447,240	2	173,245
Iowa	436	1,725,435	30	274,060	6	216,965
Kansas	487	1,624,605	65	309,535	21	335,145
Kentucky	237	1,790,355	141	972,165	7	575,625
Louisiana	156	2,316,980	15	136,625	29	1,021,290
Maine	116	731,435	18	189,525	1	1,550
Maryland	141	2,557,990	26	2,216,980	2	57,000
Massachusetts	163	4,625,140	25	830,420		
Michigan	221	6,058,840	10	4,159,380	12	548,260
Minnesota	311	2,083,510	18	143,515	9	970,545
Mississippi	127	837,190	4	265,770		
Missouri	239	3,339,770	92	580,595	8	1,915,715
Montana	95	407,060	14	189,325	2	16,450
Nebraska	44	630,450	4	8,280	4	365,785
Nevada	26	187,595	2	99,000	1	4,300
New Hampshire	76	439,495	5	48,200		
New Jersey	308	5,358,185	32	2,213,135		
New Mexico	101	576,920	15	76,970		
New York	624	15,361,600	133	2,833,150	3	24,450
North Carolina	238	2,147,325	123	1,744,075	1	2,000
North Dakota	74	305,055	12	43,855	15	182,135
Ohio	446	7,631,760	73	3,794,505	68	2,289,150
Oklahoma	247	1,701,545	91	877,950	9	444,450
Oregon	215	1,263,970	29	242,560		
Pennsylvania	830	9,781,549	184	7,048,015	8	91,780
Puerto Rico	70	1,643,555	40	1,175,280		
Rhode Island	31	782,000	10	606,350		
South Carolina	116	1,268,520	66	876,200		
South Dakota	104	355,680	7	48,520	3	26,200
Tennessee	254	2,398,260	93	1,406,590	2	6,500
Texas	717	8,063,340	147	2,790,005	20	668,350
Utah	100	843,200	12	359,560		
Vermont	58	201,854	5	68,720		
Virginia	260	2,431,945	81	2,072,970	1	20,000
Virgin Islands	3	23,380				
Washington	167	2,052,685	14	114,625		

of treatment—arranged by population groups, States, and drainage basins

Purification and iron or manganese removal		Purification softening and iron or manganese removal		Softening only		Iron or manganese removal only		Softening and iron or manganese removal	
Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served
6	2,165	1	420	28	9,855	264	95,205	26	9,245
14	10,925	10	7,950	71	56,710	280	269,775	83	62,265
21	53,100	16	44,625	170	402,660	402	936,375	167	387,530
14	104,490	8	63,725	33	263,795	79	553,385	46	365,340
7	100,320	6	140,535	30	457,030	69	1,048,450	28	412,755
9	276,290	4	157,500	13	480,825	23	625,445	12	444,305
2	130,755	2	227,000	2	164,000	10	455,500	5	293,070
2	470,015	2	880,000	3	698,495	8	1,755,835	4	871,000
						27	73,970	1	740
1	100,000			1	1,500				
1	11,000			2	2,200				
				2	5,200	44	237,775	8	39,300
3	8,220	1	5,500	3	76,040	13	204,935		
2	52,000								
				1	700	1	180		
				1	275	2	3,080		
						5	7,825		
1	14,250	7	106,295	24	434,350	14	129,610	23	1,113,850
				6	23,550	10	10,175	2	2,295
7	65,040								
4	51,835	14	265,890	31	71,760	118	355,290	88	316,355
4	51,600	3	18,500	12	29,975	72	395,465	30	141,490
				37	359,535	182	231,480	50	141,915
		1	43,000	15	298,585	18	24,450	10	175,305
		2	8,160	8	108,325	7	39,920	2	6,050
2	2,375	6	24,855	4	63,420	22	104,215	23	160,360
4	3,550								
1	18,550					16	110,590	3	2,855
						3	20,640		
				4	7,885	25	63,415	7	169,550
1	7,240	1	2,345	3	4,755	113	236,595	17	29,135
3	6,405			3	48,795	24	84,205	1	475
11	391,900	9	151,575	15	49,210	38	60,715	14	48,125
						1	620		
		1	7,250			26	203,825	5	22,620
						2	22,250		
3	18,600			2	16,600	58	24,280	2	27,000
				2	1,600				
				3	3,835	14	925,950	5	22,305
				3	10,000	14	26,700	5	45,750
				10	27,750	4	2,400	2	2,995
				91	610,825	54	270,745	32	185,665
2	13,250	1	9,485	3	21,550	1	2,500		
				1	5,100	1	6,000		
7	33,460	1	200	11	38,875	9	35,550	2	8,500
				1	50	2	22,195		
						11	85,785	2	4,940
				9	59,060	23	30,180	1	69,000
1	2,150			1	670	32	636,470		
14	196,150	2	850,000	5	31,690	20	46,285	1	1,500
				3	4,240	28	18,655	2	3,200
1	65,755								
				1	300	2	815		

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TABLE 11. *Number of plants and population served by various functional classes of*

Population size groups, States, and major drainage basins	Total all plants		Purification only		Purification and softening	
	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served
States						
West Virginia	300	1,136,870	107	745,240	5	42,250
Wisconsin	253	2,527,330	20	1,392,345	1	19,740
Wyoming	60	213,075	11	101,615	3	7,255
MAJOR DRAINAGE BASINS						
Northeast	1,275	28,165,704	220	7,139,780	4	26,000
North Atlantic	1,036	13,357,350	189	9,736,595	7	83,490
Southeast	1,264	12,280,575	357	6,209,205	6	332,700
Tennessee River	273	1,666,795	101	1,100,960	1	4,000
Ohio River	1,597	13,614,299	497	7,656,020	58	2,084,725
Lake Erie	166	4,105,335	34	2,746,490	30	1,084,485
Upper Mississippi	1,475	14,061,875	136	3,268,215	38	2,670,870
Western Great Lakes	361	8,876,685	76	6,614,665	13	557,940
Missouri River	914	5,034,775	178	1,714,010	31	1,436,465
Southwest-Lower Mississippi	1,109	8,038,970	229	2,333,115	54	1,742,055
Colorado River	173	821,385	38	454,880	2	4,950
Western Gulf	730	7,998,535	135	2,746,295	18	783,305
Pacific Northwest	477	3,762,695	48	412,065	.....	.....
California	486	13,286,120	68	3,122,450	3	2,519,900
Great Basin	127	1,040,670	13	492,240	2	28,000
Alaska	24	79,635	2	10,115	.....	.....
Hawaii	30	433,805	8	10,690	.....	.....
Puerto Rico	70	1,643,555	40	1,175,280	.....	.....
Virgin Islands	3	23,390	.....	.....	.....	.....
Total*	11,590	138,292,173	2,369	56,943,070	267	13,358,885

*Denotes total for each major division, population groups, States, and major drainage basins.

treatment—arranged by population groups, States, and drainage basins—Continued

Purification and iron or manganese removal		Purification softening and iron or manganese removal		Softening only		Iron or manganese removal only		Softening and iron or manganese removal	
Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served
2	34,720								
				14	30,450	44	124,805	9	13,620
				18	84,715	35	199,430	24	90,615
3	24,650								
2	13,500			6	20,360	59	1,351,445	6	22,605
11	248,235	7	106,295	9	33,775	65	425,495	6	32,755
1	1,450			35	472,690	96	402,220	33	1,167,575
13	115,355	8	50,790	2	900	11	24,920		
				108	734,025	193	795,505	71	267,795
1	6,500								
6	426,050	17	279,930	24	82,165	14	13,180	13	92,210
1	7,240			80	446,725	379	925,390	152	523,740
6	9,450	6	158,850	15	81,960	38	131,430	16	204,480
18	72,470	9	45,890	36	119,110	137	325,470	37	313,115
				20	433,230	105	1,023,760	37	221,235
10	160,100	2	880,000	2	2,200				
				7	33,290	22	49,405		
2	52,000			2	5,400	3	6,815		
				3	76,040	13	204,935		
1	11,000			1	1,500				
75	1,148,050	49	1,521,755	350	2,533,370	1,135	5,679,970	371	2,845,510

TABLE 11a. *Number of plants and population served by various functional*

Population size groups, States, and major drainage basins	Total all plants		Disinfection only		Disinfection with miscellaneous treatment	
	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served
Under 500	2,125	817,555	1,245	459,130	214	80,910
500–1,000	2,165	1,799,179	1,051	858,950	231	212,199
1,000–5,000	4,295	11,047,404	1,671	3,735,014	605	1,692,200
5,000–10,000	1,161	8,595,130	389	2,323,470	182	1,331,285
10,000–25,000	935	14,859,625	258	3,355,190	145	2,315,215
25,000–50,000	420	13,736,750	104	2,306,370	88	2,888,480
50,000–100,000	196	11,696,600	48	1,759,670	32	2,035,965
Over 100,000	293	75,739,930	88	17,010,940	36	9,900,635
STATES						
Alabama	265	2,138,475	107	183,550	49	441,245
Alaska	24	79,635	20	57,020		
Arizona	56	519,335	42	160,775	2	44,800
Arkansas	176	982,605	42	59,980	23	111,365
California	521	13,398,475	308	4,294,365	89	2,979,455
Colorado	195	1,461,175	108	189,670	21	266,900
Connecticut	108	2,095,340	54	484,595	28	733,685
Delaware	27	383,770	10	32,160	1	135,000
District of Columbia	2	1,092,870				
Florida	362	3,762,115	100	282,465	144	1,130,380
Georgia	247	2,631,720	91	296,990	42	294,530
Hawaii	30	433,805	18	404,010	3	18,305
Idaho	72	339,735	52	247,820	12	33,785
Illinois	701	8,605,825	150	557,435	103	3,251,850
Indiana	353	2,972,330	126	406,160	50	301,375
Iowa	436	1,725,435	99	382,255	15	59,560
Kansas	487	1,624,085	311	380,720	45	66,015
Kentucky	237	1,790,355	52	63,680	16	14,055
Louisiana	156	2,316,980	43	399,785	9	41,380
Maine	116	731,435	62	197,055	32	322,535
Maryland	141	2,557,990	76	114,455	18	56,110
Massachusetts	163	4,625,140	62	3,058,520	28	406,760
Michigan	221	6,058,840	46	210,035	63	555,695
Minnesota	311	2,083,510	46	184,100	35	413,825
Mississippi	127	837,190	45	271,065	43	154,505
Missouri	239	3,339,770	32	72,940	12	53,625
Montana	95	407,060	58	48,595	19	150,320
Nebraska	44	630,470	5	4,900	2	17,810
Nevada	26	187,595	22	83,525	1	770
New Hampshire	76	439,495	57	244,550	7	104,165
New Jersey	308	5,358,165	137	1,121,360	61	1,116,990
New Mexico	101	576,920	46	159,715	16	334,710
New York	624	15,361,600	335	9,429,735	103	1,870,995
North Carolina	238	2,147,325	59	155,050	29	155,650
North Dakota	74	305,055	29	33,370		
Ohio	446	7,631,760	67	227,365	45	229,055
Oklahoma	247	1,701,545	124	266,930	14	65,150
Oregon	215	1,263,970	162	330,850	17	672,350
Pennsylvania	830	9,781,549	528	1,887,049	77	636,190
Puerto Rico	70	1,643,555	8	207,965	21	254,160
Rhode Island	31	782,000	9	65,240	7	75,425
South Carolina	116	1,268,520	12	31,395	6	203,080
South Dakota	101	355,680	53	106,160	7	15,120
Tennessee	254	2,398,260	84	189,130	34	145,900
Texas	717	8,063,340	412	2,659,360	51	556,105
Utah	100	813,200	77	372,160	9	80,270
Vermont	58	201,854	49	122,755	4	10,379
Virginia	260	2,431,945	118	141,155	13	97,415
Virgin Islands	3	23,390	3	23,390		
Washington	167	2,052,685	112	610,560	28	1,271,130

classes of treatment—arranged by population groups, States, and drainage basins

Miscellaneous plants with disinfection						Miscellaneous treatment		Miscellaneous plants					
Aeration	Sedimentation	Coagulation sedimentation	Ammonia	Corrosion control	Other and combination			Aeration	Sedimentation	Coagulation sedimentation	Ammonia	Corrosion control	Other and combination
Number of plants	Number of plants	Number of plants	Number of plants	Number of plants	Number of plants	Number of plants	Population served	Number of plants	Number of plants	Number of plants	Number of plants	Number of plants	Number of plants
28	12	1	1	77	95	142	63,140	13	1			59	69
33	8	3		92	95	116	90,700	16	1			51	48
82	19	1	10	196	297	231	521,735	33	1			79	118
25	4		7	39	109	50	347,925	5				19	26
14	2		4	53	72	26	310,840		1			15	10
9	2		4	29	44	10	349,600					5	5
2	1			13	16	2	335					2	
2	1		5	8	20	1	131,000					1	
13				16	20	1	3,300	1					
			2										
12	15			11	12	5	5,625						
				10	52	23	74,955	3	1			4	1
1	1		1	2	16	5	5,320					5	14
	1			18	9	2	4,300					1	4
					1	2	7,500	1				1	1
32		1	1	18	92	34	74,855	6				5	1
5				9	28	4	2,680	2					23
	1				2	1	800						2
9	1			2	10	3	3,250						1
3				65	28	68	324,155	15				26	3
				34	13	4	7,310					2	27
1				6	8	17	60,165	5				4	2
1	1	2		33	12	1	300						8
2				1	11								1
				4	3	1	1,500						
			4	5	23	2	2,220					1	1
				11	7								1
	2			22	6	45	308,800						
				30	31	24	54,630					33	12
13			1	15	19	68	91,455					15	9
				4	26	4	5,970	1				59	9
8				3	1	8	15,370					1	2
	2		6	2	9	1	1,250		1			3	5
1					2								
				3	4	5	20,330						
14	2		1	23	21	12	73,455	2				4	1
	8				8	22	3,925					7	3
9	3		4	43	44	28	251,180	7				2	20
2			1	19	7	3	3,900	1				5	16
						4	12,550		1			1	1
8												1	2
1	1			27	10	16	24,450	5					
	2			3	9	2	1,580	1				4	7
15			2	2	11	4	6,920	1					1
			1	21	40	2	1,620					1	2
					21							1	1
				6	1	2	12,540						
				3	3	19	67,200					2	
			1	4	2	1	1,440					14	5
3		1		3	27	7	10,860	2					1
32		1		16	32	15	13,895	7	1			1	4
	3		1	2	3	2	1,210	1					7
					4								1
2	1			4	6	13	8,555					10	3
3	3		4	3	15	10	55,255	1					9

TABLE 11a. *Number of plants and population served by various functional classes of*

Population size groups, States, and major drainage basins	Total all plants		Disinfection only		Disinfection with miscellaneous treatment	
	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served
West Virginia	300	1,136,870	97	76,830	18	67,585
Wisconsin	253	2,527,330	46	127,110	26	426,245
Wyoming	60	213,075	40	90,925	5	13,130
MAJOR DRAINAGE BASIN						
Northeast	1,275	28,165,704	646	14,389,700	244	4,494,569
North Atlantic	1,036	13,357,350	643	2,103,440	97	856,960
Southeast	1,264	12,280,575	375	1,060,790	277	2,121,555
Tennessee River	273	1,666,795	128	263,530	27	267,625
Ohio River	1,597	13,614,299	470	1,060,024	151	683,530
Lake Erie	166	4,105,335	31	41,900	11	29,780
Upper Mississippi	1,475	14,061,875	281	1,030,445	164	3,920,825
Western Great Lakes	361	8,876,685	86	343,090	78	840,135
Missouri River	914	5,034,775	398	580,175	75	361,650
Southwest Lower Mississippi	1,109	8,038,970	494	1,622,035	110	519,455
Colorado River	173	821,385	113	294,175	17	65,070
Western Gulf	730	7,998,555	411	2,456,900	92	868,980
Pacific Northwest	477	3,762,695	342	1,178,965	63	2,092,685
California	486	13,286,120	293	4,271,200	78	2,962,775
Great Basin	127	1,040,670	91	419,980	17	98,830
Alaska	24	79,635	20	57,020	.....	.....
Hawaii	30	433,805	18	404,010	3	18,305
Puerto Rico	70	1,643,555	8	207,965	21	254,160
Virgin Islands	3	23,390	3	23,390	.....	.....
Total*	11,590	138,292,173	4,851	31,808,734	1,533	20,456,889

*Denotes total for each major division, population size groups, States, and major drainage basin.

treatment—arranged by population groups, States, and drainage basins—Continued

Miscellaneous plants with disinfection						Miscellaneous treatment		Miscellaneous plants					
Aeration	Sedimentation	Coagulation sedimentation	Ammonia	Corrosion control	Other and combination			Aeration	Sedimentation	Coagulation sedimentation	Ammonia	Corrosion control	Other and combination
Number of plants	Number of plants	Number of plants	Number of plants	Number of plants	Number of plants	Number of plants	Population served	Number of plants	Number of plants	Number of plants	Number of plants	Number of plants	Number of plant
2	1			2	13	4	1,370	1					
1			1	2	22	83	187,130	3					3
	1				4	1	150	1				18	62
20	5		8	107	104	86	549,830	7					
6	1		1	38	51	18	81,340	2				50	29
53		1	1	63	159	66	155,060	11				9	7
4		1		6	16	2	3,410					24	31
22	3	1	2	68	55	27	166,230	3				1	1
												5	19
7				1	3	8	8,625	4					
9	1			88	66	221	548,910	22				2	2
2	2		2	34	38	38	95,745	1				106	93
7	2		4	35	27	10	16,480	1	1			16	21
16	2	1		32	67	25	25,725	4				2	6
	4		2		11	1	110					8	13
31	7	1		16	37	33	20,280	6	1				1
3	6		10	7	37	18	66,675	2	1			2	24
12	5			10	51	22	74,925	3	1			1	14
1	10		1	2	3	2	1,130	1				5	13
													1
	1				2	1	800						
					21								1
193	49	5	31	507	748	578	1,815,275	67	4			231	276

TABLE 12. *Number of plants and population served by various types of disinfection*

Population size groups, States, and major drainage basins	Total, all plants		Chlorine-ammonia		Liquid chlorine	
	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served
POPULATION SIZE GROUPS						
Under 500	1,851	710,250	3	2,550	493	240,380
500–1,000	1,877	1,583,874	2	4,270	781	758,035
1,000–5,000	3,833	10,047,664	59	259,070	2,485	7,270,058
5,000–10,000	1,075	7,995,635	51	552,535	823	6,546,445
10,000–25,000	884	14,176,325	66	1,308,745	703	11,622,070
25,000–50,000	405	13,250,395	42	1,758,060	309	10,379,040
50,000–100,000	192	11,636,635	33	2,956,000	125	7,760,120
Over 100,000	288	74,666,750	52	16,169,360	210	57,100,915
STATES						
Alabama	263	2,131,575	1	32,000	119	1,900,995
Alaska	21	68,020			12	61,740
Arizona	56	519,335	2	44,800	34	447,495
Arkansas	159	936,060	3	305,300	95	534,340
California	484	13,207,545	5	395,000	347	11,999,815
Colorado	189	1,421,855	12	782,500	94	575,855
Connecticut	100	1,908,115	2	23,000	51	1,616,940
Delaware	24	375,720			20	239,545
District of Columbia	2	1,092,870			2	1,092,870
Florida	328	3,681,815	6	398,000	212	3,085,900
Georgia	239	2,626,130	8	310,185	159	2,215,905
Hawaii	26	429,430			17	385,210
Idaho	67	335,485	2	24,680	44	298,340
Illinois	569	8,252,750	15	2,594,245	343	5,455,865
Indiana	348	2,964,120	12	1,196,500	250	1,697,840
Iowa	327	1,590,325	4	125,655	131	1,266,635
Kansas	485	1,619,985	4	269,925	142	1,117,760
Kentucky	235	1,788,555	17	913,820	159	821,445
Louisiana	151	2,298,640	8	333,200	115	1,926,095
Maine	114	729,215	7	208,625	34	280,810
Maryland	138	2,525,635	4	107,195	58	2,349,530
Massachusetts	113	4,190,030			71	3,901,155
Michigan	180	5,955,350	3	287,500	112	5,516,455
Minnesota	160	1,833,345	14	789,205	110	1,000,975
Mississippi	122	830,545	1	150,000	91	653,465
Missouri	222	3,306,200	9	1,491,880	176	1,768,830
Montana	92	365,190	14	220,260	34	70,225
Nebraska	35	609,515	1	138,000	27	437,460
Nevada	26	187,595			14	60,580
New Hampshire	71	419,165			16	292,350
New Jersey	283	5,081,180	14	2,371,340	145	2,208,920
New Mexico	79	572,995			41	547,555
New York	582	15,072,635	14	444,565	273	13,629,200
North Carolina	233	2,[illegible],625	13	538,600	165	1,497,625
North Dakota	64	261,805	6	114,000	25	106,345
Ohio	340	7,353,650	17	2,036,190	182	5,040,360
Oklahoma	239	1,683,020	7	101,185	131	1,499,735
Oregon	209	1,256,270	8	654,625	94	520,575
Pennsylvania	819	9,742,909	24	1,112,960	328	7,177,383
Puerto Rico	69	1,637,405			41	1,032,200
Rhode Island	27	769,360			9	607,830
South Carolina	90	1,190,995	9	395,600	75	773,705
South Dakota	93	347,100	6	63,650	53	257,990
Tennessee	246	1,842,720	1	16,150	193	1,777,195
Texas	691	8,033,390	6	1,064,200	512	6,579,155
Utah	97	806,790	2	41,000	42	622,750
Vermont	58	201,854			24	154,790
Virginia	225	2,409,270	3	416,755	124	1,926,835
Virgin Islands	3	23,390			3	23,390
Washington	154	1,886,365	9	1,061,420	87	751,235
West Virginia	276	1,120,455	7	282,740	195	771,350
Wisconsin	124	2,223,305	7	1,149,135	66	907,390
Wyoming	59	212,925	1	5,000	32	191,185

—arranged by population groups, States, and drainage basins

Hypochlorite		Liquid and hypochlorite		Chlorine dioxide		Ozone		Other		Type not stated	
Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served
1,323	450,665	11	9,370	1	100			11	2,965	9	4,220
1,048	779,334	22	18,965	2	1,150	1	1,500	9	7,810	12	12,810
1,171	2,139,556	99	314,325					7	30,580	14	41,455
172	637,880	25	230,175					2	14,000	3	21,100
84	783,870	25	367,340	1	10,620			1	15,000	5	83,680
35	514,020	11	346,665							8	252,610
24	372,070	5	277,180	2	103,335					3	167,930
16	432,490	4	352,220	2	120,000			2	238,560	3	113,205
143	198,580										
9	6,280							2	530		
18	26,510									1	15,000
59	78,720	1	2,700					2	8,050	3	15,850
109	575,260	19	216,620								
71	32,325	6	29,050					6	2,125		
41	158,265	6	109,910								
4	136,175										
										2	46,060
102	105,055	6	46,800								
67	52,030	1	12,715					1	12,000	3	23,295
7	3,485	2	40,735								
20	9,365	1	3,100								
198	173,240	5	20,440	3	1,250			5	170,255	2	4,015
79	60,016	7	9,770								
189	167,390	1	2,925					1	715	1	27,005
323	191,245	16	41,055								
52	44,290	3	4,735					1	770	3	3,495
28	39,345										
61	112,770	11	116,390	1	10,620						
										1	1,100
73	56,810	2	11,000							2	30,530
40	258,345									1	400
61	139,695	3	11,300								
36	43,165										
29	24,945	1	2,135								
37	45,490										
42	46,945	2	27,760								
7	34,055							2	2,500	7	122,965
3	1,550										
54	113,815	1	13,000								
109	263,370	14	236,050			1	1,500	4	1,150		
32	21,240	2	3,050					1	7,500	4	37,810
278	619,165	12	334,395								
53	95,600	2	5,800							1	1,900
32	39,560										
136	165,165	4	41,935	1	70,000					5	4,410
95	76,990	1	700					1	330		
102	56,960	4	23,780								
432	678,691	32	320,540	3	453,335					9	296,845
17	292,205	2	16,155								
18	161,530										
6	21,690										
32	22,010	2	3,450					1	400		
47	33,625	4	15,350					3	86,360	6	53,600
152	193,275	13	61,100								
										2	1,030
51	142,010										
34	47,064										
92	58,945	5	6,735								
56	64,125	2	9,585								
66	52,040	3	1,425					2	16,200	4	11,700
45	52,730	6	114,050								
26	16,740										

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TABLE 12. *Number of plants and population served by various types of disinfection*

Population size groups, States, and major drainage basins	Total, all plants		Chlorine-ammonia		Liquid chlorine	
	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served
MAJOR DRAINAGE BASINS						
Northeast	1,152	27,082,854	34	2,769,360	523	21,931,690
North Atlantic	990	13,200,845	25	1,560,755	417	10,335,905
Southeast	1,179	12,094,515	38	1,903,540	747	9,574,335
Tennessee River	271	1,664,685	2	48,150	187	1,536,545
Ohio River	1,461	13,252,639	46	2,888,780	930	9,366,528
Lake Erie	137	4,068,610	10	1,301,310	79	2,637,905
Upper Mississippi	995	13,063,170	34	4,637,685	567	7,945,710
Western Great Lakes	293	8,691,300	22	2,218,015	176	6,220,745
Missouri River	867	4,976,220	32	1,141,095	406	3,471,035
Southwest-Lower Mississippi	1,058	7,388,640	26	1,209,275	621	5,773,220
Colorado River	171	787,275	4	49,800	86	652,355
Western Gulf	687	7,965,795	5	1,039,200	494	6,532,570
Pacific Northwest	451	3,543,175	12	1,802,625	234	1,555,000
California	452	13,095,710	3	374,000	321	11,917,410
Great Basin	122	1,033,850	5	67,000	68	723,570
Alaska	21	68,020	.....	.....	12	61,740
Hawaii	26	429,430	.....	.....	17	385,210
Puerto Rico	69	1,637,405	.....	.....	41	1,032,200
Virgin Islands	3	23,390	.....	.....	3	23,390
Total*	10,405	134,067,528	308	23,010,590	5,929	101,677,063

*Denotes total for each major division, population size group, States, and major drainage basins.

*—arranged by population groups, States, and drainage basins—*Continued

Hypochlorite		Liquid and hypochlorite		Chlorine dioxide		Ozone		Other		Type not stated	
Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served
551	1,531,164	36	763,295	1	10,620	1	1,500	1	7,500	5	67,725
508	902,795	37	366,340	1	33,335	.....	.....	.....	.....	3	1,715
378	467,835	10	67,450	.....	.....	.....	.....	1	12,000	5	69,355
75	59,440	6	20,150	.....	.....	.....	.....	1	400	.....	.....
452	489,341	20	69,675	4	421,150	.....	.....	4	23,470	7	15,195
44	52,660	3	6,735	1	70,000	.....	.....	.....	.....	.....	.....
376	385,715	10	58,470	1	100	.....	.....	5	164,470	3	31,020
87	166,855	7	85,285	.....	.....	.....	.....	.....	.....	1	400
412	291,210	15	70,890	.....	.....	.....	.....	1	90	1	1,900
390	349,495	12	35,840	.....	.....	.....	.....	4	5,700	6	19,410
76	66,840	1	150	.....	.....	.....	.....	3	1,130	1	17,000
161	197,955	14	59,225	.....	.....	.....	.....	7	83,245	6	53,600
186	145,995	8	39,225	.....	.....	.....	.....	1	330	.....	.....
105	566,830	19	216,620	.....	.....	.....	.....	2	8,080	3	15,850
39	133,785	.....	.....	.....	.....	.....	.....	2	2,500	8	106,995
9	6,280	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7	3,485	2	40,735	.....	.....	.....	.....	.....	.....	.....	.....
17	292,205	2	16,155	.....	.....	.....	.....	.....	.....	9	296,845
3,873	6,109,885	202	1,916,240	8	535,205	1	1,500	32	308,915	57	697,010

TABLE 13. *Number of plants and population served by selected unit processes—arranged by population groups, States, and drainage basins*

Population size groups, States, and drainage basins	Filtration								Softening			
	Rapid sand (gravity)		Slow sand (gravity)		Rapid sand (pressure)		Anthracite		Zeolite filters		Lime-soda softening	
	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served
POPULATION SIZE GROUPS												
Under 500	186	89,760	37	12,275	251	92,770	43	14,130	45	15,520	9	4,755
500–1,000	323	289,620	37	27,815	286	217,760	40	33,140	125	96,530	46	46,600
1,000–5,000	1,074	3,314,110	51	123,835	365	807,890	127	466,120	242	520,560	140	393,835
5,000–10,000	393	3,341,955	15	111,730	57	420,350	60	572,880	38	313,165	49	462,770
10,000–25,000	335	6,424,285	23	485,315	43	582,455	61	1,010,305	22	438,055	56	1,091,975
25,000–50,000	168	6,186,410	8	342,680	11	289,550	38	1,706,635	11	320,700	27	1,251,225
50,000–100,000	94	7,089,260	2	32,505	6	510,200	12	804,125	1	200	11	804,155
Over 100,000	145	43,468,485	11	2,814,720	8	1,630,200	17	3,532,160	2	2,638,900	20	6,241,150
STATES												
Alabama	81	1,457,890	5	12,640	11	16,250			2	1,640		
Alaska	1	115					3	22,500	1	1,500		
Arizona	5	301,160	3	35,300	2	5,000			2	2,200	1	4,600
Arkansas	70	654,180	2	1,450	22	27,180	6	95,250			2	59,300
California	71	5,161,260	6	30,340	20	854,260	3	24,355	1	2,500,000	3	17,900
Colorado	48	657,185	4	168,535	17	15,890	2	130,610	3	19,900	2	33,000
Connecticut	21	334,405	3	537,740	2	7,170			1	275	3	45,440
Delaware	8	191,510			5	15,850						
District of Columbia	1	566,380	1	526,490			1	566,580				
Florida	44	1,676,950	1	29,845	2	1,020	20	452,720	8	113,440	11	229,830
Georgia	91	1,315,900	3	13,225	9	616,460	11	133,960	3	1,260	6	29,060
Hawaii	5	6,940	5	21,790								
Idaho	4	47,880	3	470	1	7,000						
Illinois	140	3,581,890	24	265,490	145	545,175	25	279,315	96	315,075	16	144,440
Indiana	64	1,889,060	5	4,750	68	192,170	13	79,125	39	104,575	10	270,465
Iowa	68	953,770	4	29,650	103	167,380	40	59,005	66	85,165	19	467,115
Kansas	102	1,131,015	11	3,895	6	10,340	7	167,500	6	6,965	23	359,225
Kentucky	143	1,644,190	4	20,270	15	14,895	3	556,445	1	850	16	764,490
Louisiana	59	1,574,510	2	2,755	11	31,945	20	387,020	9	15,585	5	61,660
Maine	15	175,550	5	19,850	3	21,490			1	1,015	1	37,600
Maryland	24	2,196,400			9	39,500	5	89,535	3	2,855	5	54,600
Massachusetts	11	478,515	16	260,225	1	25,000	2	94,220	1	10,305		
Michigan	55	5,139,675	1	201,000	21	38,915	5	17,080	12	42,285	9	595,750
Minnesota	106	1,286,675	1	1,480	49	101,925	4	47,540	21	33,745	1	7,000
Mississippi	8	308,455			21	44,200	3	27,515	3	25,480		
Missouri	127	3,068,455			32	26,685	4	5,800	27	46,545		
Montana	16	204,555	1	1,230	1	3,000					2	12,175
Nebraska	15	563,030	7	29,995	11	10,990	1	800	1	1,345	1	365,785
Nevada	1	4,300			1	3,000					1	4,300
New Hampshire	5	48,200	3	20,415	1	9,500			2	20,090		

New Jersey	29	1,780,410	2	15,500	47	464,770	22	687,780	5	43,850	5	404,070
New Mexico	12	74,650	1	100	3	2,120			1	1,500	1	100
New York	80	2,529,150	24	208,475	26	478,955	26	226,315	7	20,900	8	207,150
North Carolina	110	1,700,625	2	1,700	21	34,900	11	89,800	6	36,750	2	3,000
North Dakota	31	250,395			4	1,650			5	6,660	15	151,940
Ohio	220	6,828,665	1	57,000	69	105,570	3	110,700	56	280,920	105	2,683,030
Oklahoma	76	813,795	4	3,650	3	1,850	26	625,790			3	16,800
Oregon	15	149,245			6	39,375	8	61,750			1	5,100
Pennsylvania	157	5,995,240	10	798,340	8	61,150	35	1,166,275	29	431,155	43	1,935,665
Puerto Rico	39	1,169,220			1	6,060						
Rhode Island	7	570,290			3	23,540	2	50,180	2	6,345		
South Carolina	50	748,710			5	46,715	19	410,680	2	4,940		
South Dakota	15	77,650			15	13,750	9	135,940	3	5,180	6	58,960
Tennessee	100	1,941,265	1	300	17	36,270	5	53,800	2	4,670	2	25,400
Texas	126	3,583,295	4	448,150	54	93,350	13	275,670	5	18,370	10	1,120,590
Utah	8	330,885			3	675	1	20,000				
Vermont	4	61,870			2	8,990						
Virginia	62	2,119,225	1	8,350	15	87,750	14	170,090	9	7,970	2	4,000
Virgin Islands												
Washington	11	67,300	1	1,150	5	11,570	3	58,000	2	1,050	2	26,000
West Virginia	116	727,995	6	9,300	38	53,490	15	305,200	12	59,515	11	84,030
Wisconsin	31	1,509,175	5	154,780	31	65,575	6	60,950	31	63,760		
Wyoming	10	27,160	2	250	2	21,240	2	60,000			2	6,955
Major Drainage Basins												
Northeast	154	5,509,810	18	1,079,160	64	77,360	43	1,018,145	17	75,680	16	685,260
North Atlantic	468	8,936,560	11	596,560	54	450,530	36	1,351,975	22	56,320	14	144,990
Southeast	375	7,135,760	11	57,410	27	125,050	63	1,091,385	24	162,930	18	261,590
Tennessee River	95	1,021,555	1	300	15	34,895	4	65,500	2	4,670	2	700
Ohio River	613	9,541,220	28	856,160	197	309,935	55	1,486,540	108	722,410	147	4,579,060
Lake Erie	72	3,097,235	1	57,000	22	24,105	6	512,365	25	113,520	76	1,119,660
Upper Mississippi	306	7,228,210	24	283,715	319	592,325	66	927,770	193	871,705	51	634,700
Western Great Lakes	97	3,266,850	5	291,510	32	83,250	8	99,030	26	76,300	9	595,750
Missouri River	265	3,446,945	20	192,580	103	105,170	26	475,750	11	65,825	38	903,595
Southwest-Lower Mississippi	308	4,576,455	13	26,070	65	110,456	60	1,172,870	15	41,020	21	209,860
Colorado River	25	417,535	3	35,300	14	14,705	1	14,100	2	2,200	3	11,400
Western Gulf	118	1,322,600	4	445,150	52	86,590	10	260,760	5	18,370	11	1,120,600
Pacific Northwest	30	253,515	5	2,250	12	52,955	11	119,750	2	1,650	3	31,100
California	65	3,009,270	6	10,140	29	254,260	3	24,555	1	2,560,000	2	9,900
Great Basin	11	880,700			2	3,550	1	20,000			1	8,000
Alaska	1	115										
Hawaii	5	6,940	3	24,700			3	22,500	1	1,500		
Puerto Rico	39	1,169,220										
Virgin Islands					1	6,060						
Total*	2,733	70,201,885	184	3,950,875	1,027	4,551,175	398	8,139,495	486	4,347,650	358	10,296,465

*Denotes total for each major division, population groups, States, and major drainage basins.

TABLE 13. *Number of plants and population served by selected unit processes—arranged by population groups, States, and drainage basins*—Con.

Population size groups, States, and major drainage basins	Aeration		Taste-odor control		Corrosion control		Laboratory control (at plant)					
							Total	Chemical	Bacterio-logical	Both	None	Unknown
	Number of plants	Population served	Number of plants	Population served	Number of plants	Population served	Number of plants	Number of plants	Number of plants	Number of plants	Number of plants	Number of plants
POPULATION SIZE GROUP												
Under 500	392	139,340	32	9,645	268	107,710	2,125	232	9	10	1,492	382
500–1,000	507	392,550	90	84,530	400	342,115	2,165	423	12	31	1,418	281
1,000–5,000	1,629	2,595,215	380	1,349,700	981	2,671,715	4,295	1,145	27	206	2,471	446
5,000–10,000	266	2,048,360	196	1,747,895	303	2,571,880	1,161	309	18	199	530	105
10,000–25,000	211	3,647,790	212	3,861,680	294	5,109,245	935	206	32	273	356	68
25,000–50,000	97	3,099,635	119	5,015,360	171	6,165,385	420	60	17	195	122	26
50,000–100,000	41	2,570,180	69	5,532,850	84	5,511,550	196	12	10	120	37	17
Over 100,000	46	7,086,335	101	30,845,405	99	25,102,610	293	14	10	201	49	19
STATES												
Alabama	56	337,190	4	65,800	101	1,496,775	265	70	3	1	164	27
Alaska							24	4	2	1	15	2
Arizona	2	6,100	4	271,160	1	4,600	56	3		3	48	2
Arkansas	61	247,700	18	490,600	45	469,980	176	66		15	95	
California	57	1,341,505	32	874,695	78	2,514,945	521	4	18	54	306	139
Colorado	10	155,600	29	849,360	5	20,010	195	19	2	10	117	47
Connecticut	10	480,350	6	50,315	41	1,319,450	108	13	1	20	27	47
Delaware	8	145,700	4	192,000	3	137,150	27	3	1	5	17	1
District of Columbia			2	1,092,870	2	1,092,870	2			2		
Florida	189	2,097,485	13	342,620	68	737,225	362	43	6	35	49	229
Georgia	32	180,925	37	1,404,800	86	1,302,360	247	53	1	33	150	10
Hawaii	2	18,425	1	895	2	20,175	30			2	28	
Idaho			2	35,500	3	21,500	72	3		3	61	5
Illinois	271	853,590	117	3,614,700	245	3,034,380	701	229	10	80	336	46
Indiana	116	673,675	23	1,444,055	66	237,805	353	301		33	18	1
Iowa	257	528,790	36	652,010	88	606,175	436	124	6	11	237	58
Kansas	60	585,210	45	578,830	56	667,685	487	47		10	421	9
Kentucky	46	525,430	72	1,275,750	62	1,043,610	237	72	3	19	80	63
Louisiana	58	632,930	32	673,305	37	1,277,795	156	79		14	62	1
Maine	2	56,150	8	90,905	24	281,560	116	3	2	4	107	
Maryland	21	166,390	5	98,200	45	2,389,445	141	75		18	43	5
Massachusetts	17	548,280	7	332,575	78	1,264,295	163	7	6	13	135	2
Michigan	31	99,205	17	4,448,160	89	1,118,445	221	71	9	60	75	6
Minnesota	137	303,455	8	637,085	118	453,330	311	22	6	17	258	8
Mississippi	65	243,360	4	265,770	43	322,930	127	13			112	2
Missouri	112	433,415	6	195,865	27	830,660	239	63	2	24	6	144
Montana	4	47,395	11	201,725	8	127,930	95	8	3	7	54	23
Nebraska	34	227,465	3	372,375	3	372,435	44	3		2	16	23
Nevada	2	5,070	1	4,300			26	2	1	2	12	9
New Hampshire	3	28,250	2	40,000	12	154,690	76	1			49	26

New Jersey	97	1,505,805	21	1,742,030	78	2,036,895	308	16	5	37	234	16
New Mexico			4	15,800	4	57,625	101	4	2	4	89	2
New York	80	1,379,015	79	2,502,770	125	3,279,615	624	61	10	100	421	32
North Carolina	28	89,350	45	1,140,475	133	1,870,475	238	16		100	121	1
North Dakota	19	139,795	9	122,795	7	137,770	74	22		3	48	1
Ohio	157	867,375	85	5,480,945	159	3,617,605	446	126	2	117	200	1
Oklahoma	30	169,235	51	792,645	44	360,540	247	76	1	11	155	4
Oregon	5	32,805	17	112,900	11	37,050	215	37	3	3	163	9
Pennsylvania	62	922,570	120	6,053,685	101	4,638,290	830	93	14	95	605	23
Puerto Rico	5	444,350	3	370,650	35	978,175	70	25		13	30	2
Rhode Island	6	499,650	8	196,150	16	287,140	31	1		10	18	2
South Carolina	9	93,700	20	516,790	96	1,204,545	116	40		33	41	2
South Dakota	28	84,120	10	115,970	13	132,860	104	17		1	78	8
Tennessee	66	1,113,855	15	393,190	77	912,020	254	71	1	67	101	14
Texas	133	1,331,220	65	3,199,735	52	1,994,135	717	64	7	64	573	9
Utah	2	6,300	4	206,960	4	59,660	100	1	1	6	44	48
Vermont							58		1		57	
Virginia	44	842,955	41	1,998,225	81	2,056,770	260	47	1	20	185	7
Virgin Islands							3				3	
Washington	5	122,750	6	894,820	9	258,835	167	22	4	7	119	15
West Virginia	74	637,195	23	577,840	50	532,090	300	81	1	21	1	196
Wisconsin	65	559,330	19	1,405,530	68	204,085	253	171		25	52	5
Wyoming	2	46,850	5	25,555	1	5,200	60	9			39	12
Major Drainage Basins												
Northeast	170	3,935,520	116	4,498,745	337	8,025,750	1,275	97	21	167	880	110
North Atlantic	121	1,885,175	103	7,059,915	188	8,943,580	1,036	142	14	107	720	53
Southeast	346	2,983,550	130	3,794,965	511	6,780,795	1,264	230	9	204	558	263
Tennessee River	30	74,255	10	385,075	63	962,140	273	46	2	46	164	15
Ohio River	433	3,554,280	259	7,592,985	372	5,663,880	1,597	615	13	209	500	260
Lake Erie	52	163,060	43	3,606,865	47	1,728,920	166	45		50	71	
Upper Mississippi	614	1,876,720	123	4,584,800	464	4,155,215	1,475	463	18	95	771	128
Western Great Lakes	59	508,330	46	6,578,100	107	1,234,125	361	139	9	96	106	11
Missouri River	270	1,125,840	90	1,906,710	109	1,789,885	914	165	3	38	539	169
Southwest-Lower Mississippi	280	2,444,140	146	2,581,970	204	2,914,850	1,109	294	5	65	679	66
Colorado River	3	10,400	9	305,860	2	5,880	173	11	1	4	110	47
Western Gulf	124	1,289,230	57	3,032,335	54	1,948,130	730	37	8	63	502	10
Pacific Northwest	11	195,555	27	1,095,220	24	357,385	477	61	10	14	359	33
California	54	1,331,015	29	866,205	74	2,493,175	486	3	15	50	294	124
Great Basin	6	17,560	7	215,450	7	80,150	127	4	5	11	56	51
Alaska							24	4	2	1	15	2
Hawaii	2	18,425	1	805	2	20,175	30			2	28	
Puerto Rico	5	444,350	3	370,650	35	978,175	70	25		13	30	2
Virgin Islands							3				3	
Total*	2,580	21,857,405	1,199	48,476,745	2,600	48,082,210	11,590	2,401	135	1,235	6,475	1,344

*Denotes total for each major division, population size groups, States, and major drainage basins.

ANALYSIS AND DISCUSSION

General

In 1963 there were 19,236 water producing facilities furnishing water to 150,600,000 persons living in some 20,900 communities. The community total is an estimate only, since some of the States did not return the report form circulated for communities served by water facilities not community-owned. The population thus served, however, is accounted for.

The number of facilities increased by 1,428 (8 percent) over that of the 1958 inventory, while the population served was greater by 17.5 million (13 percent increase). This population represents 79 percent of the estimated total U.S. population as of January 1, 1963, including Puerto Rico and the Virgin Islands. Five years earlier, 77 percent of the population was connected to public water facilities.

While the number of surface water sources continued to decline from 29.6 percent in 1948 to 17.8 percent of all sources in 1963, surface waters still served 54.3 percent of the connected population (2.4 percentage points lower than in 1958). The population using both surface and ground waters increased from 9.6 to 12.9 percent, with a concomitant decrease in ground water users from 33.7 to 32.8 percent.

Only 8.2 percent of the population received untreated water. A small 0.8 percent received both treated and untreated water. These were in the smaller places since 40.6 percent of all facilities by number were in these two categories.

There were 11,426 facilities furnishing all treated water to 137 million people, representing 9 of 10 persons connected to public supplies. (An additional 164 facilities served both treated and untreated water.) Treatment, in this analysis, is any action taken by man upon the water, from simple aeration to the most sophisticated purfication-softening processes. Seasonal and auxiliary treatments are omitted. As in 1958, simple chlorination without any other process was the most common type, comprising 41.9 percent of the treatment processes employed. However, this was not the extent to which disinfection was practiced. Altogether 10,405 plants used some disinfecting agent on water served to 123,000,000 persons. Table 3 shows that 57.0 percent of the plants used liquid chlorine to serve 75.8 percent of the persons receiving disinfected water.

Table 14 shows by States, the percentage distribution of facilities by source of supply and treatment status. As would be expected, there is wide fluctuation among them as to source and/or supply. In Nebraska 99.1 percent of the facilities furnish ground water only, and 10 percent of all facilities furnish some kind of treatment. In Maine, only 40.9 percent of the facilities furnish ground water, but 73.0 percent provide treatment. In Puerto Rico the percentages are 38.6 ground and 100 percent treated.

TABLE 14. *Percent of facilities by source of supply and treatment by State*

State	Percent of total facilities served by—			Percent of total facilities served by—		
	Surface sources	Ground sources	Both surface and ground sources	Treated supplies	Untreated supplies	Both treated and untreated supplies
Alabama	23.2	74.5	2.3	88.5	10.8	0.7
Alaska	64.1	28.2	7.7	61.5	38.5	.0
Arizona	4.0	93.3	2.7	24.1	75.0	.9
Arkansas	19.9	78.4	1.7	75.9	24.1	.0
California	13.4	79.8	6.8	28.8	69.2	2.0
Colorado	29.3	62.4	8.3	62.1	37.9	.0
Connecticut	34.2	49.0	16.8	66.5	30.3	3.2
Delaware	12.2	87.8	.0	65.9	34.1	.0
District of Columbia	100.0	.0	.0	100.0	.0	.0
Florida	3.4	96.4	.2	76.4	22.5	1.1
Georgia	19.1	78.0	2.9	58.7	41.1	.2
Hawaii	24.1	67.5	8.4	36.1	63.9	.0
Idaho	16.7	76.5	6.8	36.5	62.5	1.0
Illinois	12.9	86.1	1.0	76.8	23.2	.0
Indiana	12.2	85.0	2.8	89.6	10.4	.0
Iowa	4.7	94.1	1.2	60.6	38.4	1.0
Kansas	15.0	82.0	3.0	99.8	.2	.0
Kentucky	47.6	45.1	7.3	86.8	13.2	.0
Louisiana	15.4	84.3	.3	55.3	44.3	.3
Maine	46.5	40.9	12.6	73.0	27.0	.0
Maryland	17.2	77.5	5.3	83.4	16.6	.0
Massachusetts	19.6	61.1	19.3	52.0	40.7	7.3
Michigan	15.2	83.6	1.2	43.7	56.3	.0
Minnesota	3.8	95.9	.3	51.6	48.4	.0
Mississippi	1.3	98.3	.4	54.3	45.7	.0
Missouri	20.2	79.3	.5	55.6	44.4	.0
Montana	18.8	69.1	12.1	56.4	42.4	1.2
Nebraska	.7	99.1	.2	10.0	89.8	.2
Nevada	15.8	75.4	8.8	45.6	54.4	.0
New Hampshire	42.7	44.4	12.9	59.0	35.0	6.0
New Jersey	6.0	88.9	5.1	72.4	25.4	2.2
New Mexico	5.5	92.5	2.0	40.1	59.9	.0
New York	29.2	64.4	6.4	60.6	38.4	1.0
North Carolina	39.0	59.1	1.9	64.6	35.1	.3
North Dakota	7.9	87.6	4.5	40.4	58.4	1.2
Ohio	23.1	73.8	3.1	81.7	18.3	.0
Oklahoma	23.4	73.0	3.6	62.2	37.8	.0
Oregon	34.9	55.8	9.3	58.9	39.1	2.0
Pennsylvania	28.5	57.2	14.3	86.5	13.5	.0
Puerto Rico	60.0	38.6	1.4	100.0	.0	.0
Rhode Island	17.0	74.5	8.5	66.0	34.0	.0
South Carolina	29.3	68.8	1.9	54.0	46.0	.0
South Dakota	4.4	94.0	1.6	35.3	58.7	6.0
Tennessee	20.2	72.2	7.6	91.7	8.3	.0
Texas	14.8	82.8	2.4	61.8	38.2	.0
Utah	10.7	83.6	5.7	33.6	66.4	.0
Vermont	22.2	62.7	15.1	29.7	68.7	1.6
Virginia	17.3	79.1	3.6	49.4	48.8	1.8
Virgin Islands	33.3	66.7	.0	100.0	.0	.0
Washington	17.7	76.3	6.0	34.8	63.9	1.3
West Virginia	30.7	65.2	4.1	76.1	23.9	.0
Wisconsin	4.9	94.9	.2	56.1	40.6	3.3
Wyoming	26.5	67.6	5.9	58.8	41.2	.0
Total	17.8	77.5	4.7	59.4	39.7	.9

In looking at the distribution of population served in the 53 political entities, more than half the people served use surface water (table 15). With one exception, the lowest percentage of the populations receiving treated water is 60.3 percent in Nebraska. The exception is Arizona. In 1958, 78.3 percent of the population served in Arizona received treated water. By 1963, Phoenix and Tucson had discontinued chlorination of all or part of their well supplies, placing large segments of the population into the untreated classification, so that only 37.3 percent of the population received treated water and 62.4 percent untreated. (An additional 0.3 percent received both treated and untreated water.) The second highest State serving untreated water is Nebraska, at 39.4 percent, followed closely by Nevada at 34.7 percent. The remaining States are under 30 percent with 35 States being less than 10 percent untreated. The District of Columbia was the only political entity in which 100 percent of the population served received surface water. The next highest figure is 86.6 percent for Maryland. The lowest was 4.4 percent for Hawaii.

In 1963 there were 211 facilities serving untreated surface water to 165,890 persons. Fifty of these were in California. This type of supply constitutes 6.1 percent of all surface sources, but only 0.2 percent of persons connected to surface supplies. Such facilities were mostly in small places; 139 or 66 percent were in places under 500 population.

There were 7,351 facilities serving 12,000,000 persons with untreated ground water. This is approximately one-half the facilities and one-fourth of the population concerned. All States reported some facilities in this category and 29 reported more facilities serving untreated ground water than serving treated. Of all facilities in the United States, the untreated ground water group constitutes 38 percent.

Population Groups

In considering population size groups, it must be remembered that both numbers of facilities and population served are identified herein with those facilities located in places having census populations within the ranges shown. For instance, a facility in a city of 30,000 serving another city of 25,000 is counted as one facility in the 25,000–50,000 group and all 55,000 persons are counted in that same size group. As another example, a city of over 100,000 with three major facilities serving 275,000 has, in addition, 39 private facilities serving from 100 to 18,000 each. All 42 facilities and their populations are counted in the over-100,000 group. A reverse of this—a utility district with 4 facilities serving 27 communities of various sizes totaling more than 1,000,000 population is counted as 4 facilities and is included in the over-100,000 group.

Table 16 shows the percentage of facilities and population served in each population size group broken down as to water source and treatment status. Table 17 shows the percentage of the U.S. total in each

TABLE 15. *Percent of population served by source of supply and treatment by State*

State	Percent of total estimated population served by—			Percent of total estimated population served by—		
	Surface sources	Ground sources	Both surface and ground sources	Treated supplies	Untreated supplies	Both treated and untreated supplies
Alabama	58.5	36.6	4.9	94.3	4.1	1.6
Alaska	14.9	51.6	3.5	92.0	8.0	.0
Arizona	21.8	75.9	2.3	37.3	62.4	.3
Arkansas	46.2	44.8	9.0	92.2	7.8	.0
California	52.2	41.4	6.4	74.1	23.5	2.4
Colorado	63.4	19.6	17.0	94.0	6.0	.0
Connecticut	68.8	9.1	22.1	94.9	4.5	.6
Delaware	47.1	52.9	.0	93.6	6.4	.0
District of Columbia	100.0	.0	.0	100.0	.0	.0
Florida	12.6	87.3	.1	95.0	3.3	1.7
Georgia	69.5	28.3	2.2	94.1	5.8	.1
Hawaii	8.4	91.0	4.6	73.0	27.0	.0
Idaho	11.9	66.1	22.0	66.1	24.5	9.4
Illinois	69.4	29.0	1.6	97.2	2.8	.0
Indiana	46.8	47.2	6.0	93.0	7.0	.0
Iowa	17.7	61.2	21.1	89.9	9.0	1.1
Kansas	27.3	58.1	14.6	99.8	.2	.0
Kentucky	81.6	16.0	2.4	99.1	.9	.0
Louisiana	59.2	40.8	.0	91.0	8.8	.2
Maine	69.5	13.4	17.1	95.0	5.0	.0
Maryland	86.6	12.4	1.0	99.4	.6	.0
Massachusetts	64.2	20.1	15.7	85.6	8.6	5.8
Michigan	79.2	19.0	1.8	94.0	6.0	.0
Minnesota	47.7	51.3	1.0	85.7	14.3	.0
Mississippi	22.0	72.9	5.1	85.3	14.7	.0
Missouri	79.8	19.3	.9	94.6	5.4	.0
Montana	47.3	24.1	28.6	85.2	14.2	.6
Nebraska	35.8	64.1	.1	60.3	39.4	.3
Nevada	25.2	37.5	37.3	65.3	34.7	.0
New Hampshire	49.8	21.2	29.0	84.3	10.0	5.7
New Jersey	44.1	39.3	16.6	94.0	4.4	1.6
New Mexico	7.2	82.1	10.7	80.8	19.2	.0
New York	28.4	20.0	51.6	97.7	1.9	.4
North Carolina	82.1	16.8	1.1	93.6	6.3	.1
North Dakota	44.0	41.0	15.0	81.7	17.7	.6
Ohio	71.0	25.7	3.3	97.9	2.1	.0
Oklahoma	48.4	29.2	22.4	91.2	8.8	.0
Oregon	69.8	19.6	10.6	91.6	8.0	.4
Pennsylvania	78.4	12.7	8.9	99.2	.8	.0
Puerto Rico	72.0	27.6	.4	100.0	.0	.0
Rhode Island	61.0	22.8	16.2	95.8	4.2	.0
South Carolina	72.0	25.7	2.3	89.3	10.7	.0
South Dakota	21.4	70.2	8.4	81.1	14.6	4.3
Tennessee	46.8	45.4	7.8	99.0	1.0	.0
Texas	33.1	42.8	24.1	93.5	6.5	.0
Utah	26.8	49.7	23.5	81.2	18.8	.0
Vermont	57.7	19.4	22.9	75.4	21.1	3.5
Virginia	71.0	14.2	14.8	93.6	6.1	.3
Virgin Islands	65.2	34.8	.0	100.0	.0	.0
Washington	46.4	40.3	13.3	82.2	15.5	2.3
West Virginia	61.5	31.2	7.3	97.1	2.9	.0
Wisconsin	52.8	46.8	.4	90.3	8.1	1.6
Wyoming	23.5	43.3	33.2	85.5	14.5	.0
Total	54.3	32.8	12.9	91.0	8.2	.8

TABLE 16. *Percent of facilities and population served by source of supply and treatment—arranged by population groups*

Population group	Percent of total facilities served by—			Percent of total facilities served by—		
	Surface sources	Ground sources	Both surface and ground sources	Treated supplies	Untreated supplies	Both treated and untreated supplies
Less than 500	11.0	86.9	2.1	38.7	60.9	0.4
500–1,000	13.1	83.6	3.3	57.0	42.3	.7
1,000–5,000	19.3	75.1	5.6	69.9	29.1	1.0
5,000–10,000	25.5	66.8	7.7	76.3	22.8	.9
10,000–25,000	28.2	62.2	9.6	74.6	23.7	1.7
25,000–50,000	29.0	60.8	10.3	70.9	26.7	2.4
50,000–100,000	36.6	58.7	4.7	64.4	34.2	1.4
More than 100,000	42.1	52.6	5.3	72.9	26.6	.5
Total	17.8	77.5	4.7	59.4	39.7	.9

Population group	Percent of total estimated population served by—			Percent of total estimated population served by—		
	Surface sources	Ground sources	Both surface and ground sources	Treated supplies	Untreated supplies	Both treated and untreated supplies
Less than 500	12.3	84.1	3.6	46.2	52.6	1.2
500–1,000	16.0	80.3	3.7	61.3	38.0	.7
1,000–5,000	24.7	68.5	6.8	76.3	22.6	1.1
5,000–10,000	31.8	58.5	9.7	83.8	15.3	.9
10,000–25,000	36.9	52.2	10.9	86.3	11.0	2.7
25,000–50,000	41.8	43.9	14.3	91.1	7.1	1.8
50,000–100,000	59.0	33.3	7.7	89.7	9.3	1.0
More than 100,000	70.5	13.5	16.0	98.1	1.8	.1
Total	54.3	32.8	12.9	91.0	8.2	.8

population size group similarly broken down, and table 18 shows these percentages as cumulative data. Untreated water is furnished by more than 60 percent of the facilities in places of less than 500 population, to more than half (52.6 percent) of the persons served by all facilities in this group (table 16). These percentages decline rather sharply as the size groups increase. The lowest size group had 43.3 percent of all facilities serving untreated water. Actually, 87.0 percent of all such facilities were located in places of less than 5,000 population and served 42.5 percent of all persons receiving untreated water.

Ninety percent of the facilities serving ground water were in places under 10,000 population, reaching 39.4 percent of the ground water recipients. Nearly half of these were served untreated water. In 1958, 94 percent of the ground water facilities were in places of under 10,000 population. This 4 percentage point drop can be accounted for in two ways. Since the 1953 groupings utilized the 1950 census, many places, by the time of the 1958 inventory, probably had outgrown their indicated group and were over 10,000. Secondly, in the intervening 5 years, some of the larger places had either abandoned or turned to ground supplies to

TABLE 17. *Percent of facilities and population served by source of supply and treatment in each population size group*

Population group	Total	Percent of total facilities served by—					
		Surface sources	Ground sources	Both surface and ground sources	Treated supplies	Untreated supplies	Both treated and untreated supplies
Less than 500	28.2	17.4	31.7	12.5	18.4	43.3	12.2
500–1,000	19.5	14.3	21.1	13.5	18.7	20.7	15.2
1,000–5,000	31.5	34.1	30.5	37.7	37.0	23.0	39.2
5,000–10,000	7.8	11.2	6.7	12.9	10.0	4.5	8.5
10,000–25,000	6.4	10.1	5.1	13.0	8.0	3.8	12.8
25,000–50,000	3.0	4.8	2.3	6.5	3.6	2.0	8.5
50,000–100,000	1.5	3.2	1.2	1.6	1.7	1.3	2.4
More than 100,000	2.1	4.9	1.4	2.3	2.5	1.4	1.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Population group	Total	Percent of total population served by—					
		Surface sources	Ground sources	Both surface and ground sources	Treated supplies	Untreated supplies	Both treated and untreated supplies
Less than 500	1.2	0.3	2.9	0.3	0.6	7.4	1.6
500–1,000	1.9	.6	4.7	.6	1.3	8.9	1.7
1,000–5,000	9.5	4.3	19.8	5.0	7.9	26.2	13.0
5,000–10,000	6.7	3.9	12.9	5.1	6.2	12.6	7.6
10,000–25,000	11.1	7.5	17.6	9.4	10.5	15.0	36.3
25,000–50,000	9.8	7.6	13.1	10.9	9.8	8.6	20.9
50,000–100,000	8.6	9.3	8.7	5.1	8.4	9.8	10.2
More than 100,000	51.2	66.5	21.2	63.6	55.3	11.5	8.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

augment their surface sources. An example of this is the city mentioned above with the 39 extra facilities. These were all wells, and all were untreated.

Facilities serving surface water make up only 17.8 percent of the total but serve over half the population. In fact, 4.9 percent of them in the over-100,000 group alone serve 36.1 percent of all persons and 66.5 percent of those receiving surface water. Only 6.1 percent of these surface supplies (211) served untreated water to 166,000 people. All but 5 of those 211 facilities and all but 64,000 of the people they serve are in places of under 5,000 population.

Major Drainage Basins

Percentage data for number of facilities and population by source of supply and treatment status are shown for the major drainage basins (fig. 2) in table 19. These larger geographic areas lack the wide variations evident in State data and show the distinct differences in practices in the various parts of the country.

In 1958 the ratio of ground water to surface water supplies for the United States was 4.0:1 (erroneously reported as 2.4:1 in the 1958 Summary). With the increase of 1,300 ground supplies and 55 surface

TABLE 18. *Cumulative percent of facilities and population served by source of supply and treatment in each population size group*

Population group	Total	Cumulative percent of total facilities served by—					
		Surface sources	Ground sources	Both surface and ground sources	Treated supplies	Untreated supplies	Both treated and untreated supplies
Less than 500	28.2	17.4	31.7	12.5	18.4	43.3	12.2
500–1,000	47.7	31.7	52.8	26.0	37.1	64.0	27.1
1,000–5,000	79.2	65.8	83.3	63.7	74.2	87.0	66.6
5,000–10,000	87.0	77.0	90.0	76.6	84.2	91.5	75.1
10,000–25,000	93.4	87.1	95.1	89.6	92.2	95.3	87.9
25,000–50,000	96.4	91.9	97.4	96.1	95.8	97.3	96.4
50,000–100,000	97.9	95.1	98.6	97.7	97.5	98.6	98.3
More than 100,000	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Population group	Total	Cumulative percent of total population served by—					
		Surface sources	Ground sources	Both surface and ground sources	Treated supplies	Untreated supplies	Both treated and untreated supplies
Less than 500	1.2	0.3	2.9	0.3	0.6	7.4	1.6
500–1,000	3.1	.9	7.6	.9	1.9	16.3	3.3
1,000–5,000	12.6	5.2	27.4	5.9	9.8	42.5	16.3
5,000–10,000	19.3	9.1	39.4	11.0	16.0	55.1	23.9
10,000–25,000	30.4	16.6	57.0	24.9	26.5	70.1	60.2
25,000–50,000	40.2	24.2	70.1	31.3	36.3	78.7	81.1
50,000–100,000	48.8	33.5	78.8	36.4	44.7	88.5	91.3
More than 100,000	100.0	100.0	100.0	100.0	100.0	100.0	100.0

supplies, the ratio in 1963 was 4.3:1. However, in the conterminous States this ratio varied from 15:1 in the Upper Mississippi Basin to less than 2:1 in the Lake Erie Basin. In general, ground supplies are about 2:1 in New England, New York, and the Ohio-Tennessee Valley. They are 4:1 in the Atlantic and Eastern Gulf States and 5:1 in the area draining to the Western Great Lakes. Illinois, Iowa, Minnesota, and Wisconsin rely heavily on ground supplies, accounting for the Upper Mississippi ratio of 15:1. The Plains States, from Montana to Texas and Louisiana are more than 6:1, as are the States of California, Nevada, and Western Utah. The Colorado Basin is 4:1 and the Pacific Northwest slightly less than 3:1.

While ratios for all basins reflect a preponderance of ground supplies (not counting those facilities serving both surface and ground waters), only the Southwest-Lower Mississippi and Colorado basins in the conterminous United States furnish ground water exclusively to more than 50 percent of the population served. Nine other basins serve surface water exclusively to more than 50 percent of the population. The remaining four have from 11 to 36 percent of the population receiving mixed water, resulting in no clear majority of surface over ground supplies or vice versa.

A clearer pattern evolves when examining the percentage of facilities furnishing treated water. The contiguous Lake Erie-Ohio-Tennessee

TABLE 19. *Percent of facilities and population served by source of supply and treatment—arranged by major drainage basin*

Major basin	Percent of total facilities served by—			Percent of total facilities served by—		
	Surface sources	Ground sources	Both surface and ground sources	Treated supplies	Untreated supplies	Both treated and untreated supplies
Northeast	28.0	61.6	10.4	60.7	36.8	2.5
North Atlantic	18.4	71.5	10.1	70.4	28.9	.6
Southeast	18.6	79.8	1.6	65.7	33.7	.6
Tennessee River	29.4	63.6	7.0	91.3	8.7	.0
Ohio River	28.0	66.9	5.1	83.6	16.3	.1
Lake Erie	33.9	63.5	2.6	87.8	12.2	.0
Upper Mississippi	6.2	92.9	.9	62.3	37.1	.6
Western Great Lakes	16.5	82.2	1.3	50.3	49.1	.6
Missouri River	11.2	86.2	2.6	48.7	50.1	1.2
Southwest-Lower Mississippi	16.0	81.9	2.1	65.5	34.4	.1
Colorado River	17.8	78.1	4.1	36.6	63.0	.4
Western Gulf	12.7	84.8	2.5	59.7	40.3	.0
Pacific Northwest	24.0	68.0	8.0	45.1	53.5	1.4
California	12.9	80.2	6.9	30.1	67.9	2.0
Great Basin	11.2	82.4	6.4	27.3	72.1	.6
Alaska	64.1	28.2	7.7	61.5	38.5	.0
Hawaii	24.1	67.5	8.4	36.1	63.9	.0
Puerto Rico	60.0	38.6	1.4	100.0	.0	.0
Virgin Islands	33.3	66.7	.0	100.0	.0	.0
Total	17.8	77.5	4.7	59.4	39.7	.9

Major basin	Percent of total estimated population served by—			Percent of total estimated population served by—		
	Surface sources	Ground sources	Both surface and ground sources	Treated supplies	Untreated supplies	Both treated and untreated supplies
Northeast	43.5	20.3	36.2	94.6	3.7	1.7
North Atlantic	73.2	18.0	8.8	97.4	2.5	.1
Southeast	51.3	46.5	2.2	92.8	6.3	.9
Tennessee River	60.5	30.5	9.0	99.0	1.0	.0
Ohio River	63.0	31.2	5.8	97.7	2.3	Neg
Lake Erie	91.6	7.2	1.2	99.1	.9	.0
Upper Mississippi	58.9	37.3	3.8	93.6	6.1	.3
Western Great Lakes	78.2	20.5	1.3	93.4	6.5	.1
Missouri River	48.1	41.2	10.7	85.8	13.6	.6
Southwest-lower Mississippi	41.8	51.1	7.1	92.5	7.4	.1
Colorado River	28.5	67.9	3.6	45.2	54.6	.2
Western Gulf	30.7	44.5	24.8	92.6	7.4	.0
Pacific Northwest	50.3	35.0	14.7	84.1	13.6	2.3
California	52.8	41.1	6.1	74.8	22.8	2.4
Great Basin	23.1	49.2	27.7	71.8	27.6	.6
Alaska	44.9	51.6	3.5	92.0	8.0	.0
Hawaii	4.4	91.1	4.5	73.0	27.0	.0
Puerto Rico	72.0	27.6	.4	100.0	.0	.0
Virgin Islands	65.2	34.8	.0	100.0	.0	.0
Total	54.3	32.8	12.9	91.0	8.2	.8

basins range from 84 to 91 percent treated; the Northeast, Atlantic and East Gulf States from 61 to 70 percent. The Mississippi and Arkansas River States and the Western Gulf are in the low sixties. All the others, the Upper Plains, Southwestern and Pacific Coast States, are under 50 percent, reaching a low of 27 percent in the Great Basin. In general then, there is a decline in percentage of treated water facilities as one crosses the country from east to west.

A somewhat similar pattern is evident in the percentages of population served treated water. They range from 93 to 99 percent from the East into the Mississippi and Arkansas Valleys and Western Gulf region. To the northwest, the Missouri and Columbia Valleys are in the mid-eighties. California, Nevada, and Western Utah were in the low seventies. Only in the Colorado Basin was the percentage below 50 percent, 45.2 percent to be exact. This is a sharp change from the 73.1 percent in 1958, and was brought about, as previously stated, by the discontinuation of chlorination in Phoenix and Tucson, Ariz.

Ownership

Of the 19,006 facilities for which ownership is known, 70.9 percent of them are municipally owned, 28.9 percent privately owned, and 37, or 0.2 percent, have dual ownership (table 20). The latter are in small places, 86 percent of them having populations of under 5,000, where it is assumed that the municipality owns the distribution system (and treatment facility if any) and purchases the water from privately owned wells or springs. Private facilities increased by 792, or 16.8 percent over 1958. This was a net gain of 1.7 percentage points in the private ownership category over the 5-year period. The increase in percentages occurred in 20 States. Most were modest in size but California, with the largest number of facilities, increased the privately owned portion by 22.2 points. Eleven States showed half or more of the facilities to be investor-owned. Arizona led this list with 73.2 percent and West Virginia followed in second place with 71.1 percent, while Connecticut was third with 69.9 percent of its facilities investor-owned. California was fourth at 65.7 percent. The other 7 were between 50 and 60 percent. At the other end of the scale, Nebraska was the only State to report no private facilities. (The District of Columbia, Puerto Rico and the Virgin Islands were also in this category.) North Dakota had less than 1 percent in private ownership and nine other States had less than 10 percent of their facilities in this category.

On a basin basis, no clear-cut pattern of ownership can be discerned beyond that the percentage of private holdings are lowest in the Great Lakes, Upper Mississippi, and Missouri areas. East of the Mississippi such holdings are highest in the North Atlantic States. To the west they are highest in the three adjoining States of Arizona, California, and Nevada.

TABLE 20. *Percent of known ownership of facilities and population—served by publicly owned, privately owned and both publicly and privately owned water supplies arranged by population groups, States, and drainage basins*

State	Public		Private		Both public and private	
	Facilities	Population served	Facilities	Population served	Facilities	Population served
Alabama	79.3	90.4	20.3	9.5	0.4	0.1
Alaska	84.6	94.2	15.4	5.8	.0	.0
Arizona	26.8	77.1	73.2	22.9	.0	.0
Arkansas	84.3	87.8	15.7	12.2	.0	.0
California	34.3	78.8	65.7	21.2	.0	.0
Colorado	87.1	94.8	12.9	5.2	.0	.0
Connecticut	30.1	48.7	69.9	51.3	.0	.0
Delaware	68.3	56.4	31.7	43.6	.0	.0
District of Columbia	100.0	100.0	.0	.0	.0	.0
Florida	44.7	88.7	55.3	11.3	.0	.0
Georgia	85.4	98.5	14.6	1.5	.0	.0
Hawaii	54.3	77.0	40.8	18.5	4.9	4.5
Idaho	79.7	76.3	18.7	23.4	1.6	.3
Illinois	81.4	87.9	18.5	11.6	.1	.5
Indiana	83.1	57.9	16.6	42.0	.3	.1
Iowa	97.7	92.2	2.3	7.8	.0	.0
Kansas	96.9	95.3	3.1	4.7	.0	.0
Kentucky	63.7	83.7	34.1	14.3	2.2	2.0
Louisiana	64.9	82.0	34.4	17.8	.7	.2
Maine	49.1	75.0	50.9	25.0	.0	.0
Maryland	50.0	97.3	50.0	2.7	.0	.0
Massachusetts	83.4	96.4	16.6	3.6	.0	.0
Michigan	88.4	98.9	11.6	1.1	.0	.0
Minnesota	92.5	93.0	7.5	7.0	.0	.0
Mississippi	92.7	98.8	5.6	1.0	1.7	.2
Missouri	91.4	64.7	8.4	35.2	.2	.1
Montana	76.9	75.7	23.1	24.3	.0	.0
Nebraska	100.0	100.0	.0	.0	.0	.0
Nevada	50.9	55.4	49.1	44.6	.0	.0
New Hampshire	81.0	86.5	19.0	13.5	.0	.0
New Jersey	44.9	63.9	55.1	36.1	.0	.0
New Mexico	84.1	87.8	15.1	12.1	.8	.1
New York	63.0	91.5	37.0	8.5	.0	.0
North Carolina	81.4	93.9	18.6	6.1	.0	.0
North Dakota	99.4	99.9	.6	.1	.0	.0
Ohio	94.7	96.6	5.3	3.4	.0	.0
Oklahoma	90.6	98.9	9.4	1.1	.0	.0
Oregon	73.0	92.1	27.0	7.9	.0	.0
Pennsylvania	48.5	64.1	51.5	35.9	.0	.0
Puerto Rico	100.0	100.0	.0	0	.0	0
Rhode Island	57.4	92.8	42.6	7.2	.0	.0
South Carolina	72.4	90.7	27.6	9.3	.0	.0
South Dakota	94.4	95.6	5.6	4.4	.0	.0
Tennessee	85.3	87.7	14.3	12.2	.4	.1
Texas	73.6	97.4	26.4	2.6	.0	.0
Utah	69.6	93.3	29.4	6.5	1.0	.2
Vermont	49.2	91.1	50.8	8.9	.0	.0
Virginia	40.5	80.6	59.3	19.3	.2	.1
Virgin Islands	100.0	100.0	.0	.0	.0	.0
Washington	71.9	94.9	27.4	5.0	.7	.1
West Virginia	28.9	47.1	71.1	52.9	.0	.0
Wisconsin	95.5	96.8	4.5	3.2	.0	.0
Wyoming	74.2	81.0	21.8	9.1	4.0	9.9
Total	70.9	85.5	28.9	14.4	.2	.1

TABLE 20. *Percent of known ownership of facilities and population—served by publicly owned, privately owned and both publicly and privately owned water supplies arranged by population groups, States, and drainage basins*—Continued

Population groups	Public		Private		Both public and private	
	Facilities	Population served	Facilities	Population served	Facilities	Population served
Less than 500	60.8	66.5	39.0	33.3	0.2	0.2
500–1,000	74.7	77.1	25.0	22.6	.3	.3
1,000–5,000	78.0	81.9	21.8	17.9	.2	.2
5,000–10,000	74.8	85.2	25.1	14.6	.1	.2
10,000–25,000	71.9	82.9	27.9	16.9	.2	.2
25,000–50,000	63.8	83.5	36.0	16.2	.2	.3
50,000–100,000	58.4	81.2	41.6	18.8	.0	.0
More than 100,000	62.5	88.7	37.5	11.3	.0	.0
Total	70.9	85.5	28.9	14.4	.2	.1
Northeast	59.2	84.3	40.8	15.7	.0	.0
North Atlantic	48.3	77.6	51.7	22.4	.0	.0
Southeast	69.7	92.4	30.1	7.5	.2	.1
Tennessee River	77.3	82.7	22.7	17.3	.0	.0
Ohio River	65.6	71.6	34.0	28.1	.4	.3
Lake Erie	92.1	97.4	7.9	2.6	.0	.0
Upper Mississippi	89.8	85.5	10.1	14.2	.1	.3
Western Great Lakes	88.5	96.5	11.5	3.5	.0	.0
Missouri River	95.3	93.2	4.6	6.4	.1	.4
Southwest-Lower Mississippi	85.2	91.2	14.4	8.7	.4	.1
Colorado River	49.2	80.0	50.1	19.8	.7	.2
Western Gulf	74.2	96.4	25.7	3.5	.1	.1
Pacific Northwest	72.8	90.3	26.6	9.6	.6	.1
California	34.7	79.2	65.3	20.8	.0	.0
Great Basin	56.2	76.8	43.1	23.1	.7	.1
Alaska	84.6	94.2	15.4	5.8	.0	.0
Hawaii	54.3	77.0	40.8	18.5	4.9	4.5
Puerto Rico	100.0	100.0	.0	.0	.0	.0
Virgin Islands	100.0	100.0	.0	.0	.0	.0
Total	70.9	85.5	28.9	14.4	.2	.1

From a population size standpoint, there were percentage increases of private facilities in seven of the eight size groups. These increases of 968 were offset by a decrease of 176 in the 500–1,000 group so that the net increase was 792. The increases amounted to 11 percent over 1958 in the under-500 and 1,000–5,000 groups. Above that the number of private facilities ranged from nearly double to more than treble what they were 5 years earlier. Numbers alone, however, can be misleading. All of these additional facilities were small ones as can be proved by examining the change in average size between the two periods. The overall average private facility size dropped from 4,325 in 1958 to 3,900 persons in 1963, a decrease of about 10 percent. This situation is more dramatically revealed by examining the separate size groups. The three groups under 5,000 population range between 87 and 96 percent of the average size in 1958. Above that size group they drop sharply to 55, 65, 47, 30 and 35 percent of 1958. Also in 1958 each average size of private companies fell within the limits of the indicated population size group; in 1963 all but the two smallest (under 1,000) fell drastically below the lower limits of each group. This reinforces the caveat cited

under "Population Groups," that the population served, in whatever size group, corresponds with that shown for places where actual census figures were used and does not necessarily relate to the facility size. Only under these circumstances could the 147 private facilities in places of over 100,000 population show, as they did, a "population served" average of something less than 59,000.

Overall, the private facilities served an average of 3,900 persons, which is only 41 percent of the average 9,500 served by public facilities. Only in the three smallest size groups under 5,000 does the average size of private facilities even approximate public facilities, and here the percentage is only between 78 and 88 percent. The next five groups of private facilities are 51, 53, 34, 33 and 21 percent of the size of public facilities.

Of the total population served by facilities of known ownership status, 14.4 percent are served by private companies. This is 1.1 percentage points lower than in 1958, although the number of people so served increased by 5.4 percent. Not all of this increase can be attributed to new companies. Part of it is due to better reporting, as witness a net decrease of "unknowns" from 468 to 230 facilities and a decrease in the dual ownership category from 103 to 37 facilities—although it must be said there was little net decrease in the population served by these two groups—a half-million at most.

In only two States was more than half the population served by private facilities, 51.3 percent in Connecticut and 52.9 percent in West Virginia. Delaware, Indiana, and Nevada ranged from 42.0 to 44.6 percent. Missouri, New Jersey, and Pennsylvania ranged from 35.2 to 36.2 percent. All others were 25.0 percent or less, with 27 States under 10.0 percent. Looking at the larger geographic areas such as major basins, there seems to be no clear-cut pattern except that the higher percentages served by private facilities are in the North Atlantic-Ohio-Tennessee Valley States and the far West and Southwest.

As to population sizes, one person in three served by facilities in places of under 500 population is connected to a private water company. In other population size groups this percentage then gradually declines from 22.6 in places of 500–1,000 population to 11.3 percent in the largest places of over 100,000.

Treatment Facilities

In 1963 there were 11,590 water treatment plants serving 138,292,000 persons. As stated earlier, "treatment" means any action taken by man on water before delivery to the user. This action may vary from simple aeration to the most complex purification processes. Most of the plants (41.9 percent) employ disinfection only, plants employing purification alone or in combination with some other process accounted for 23.8 percent of the total, but served 52.8 percent of the people receiving

treated water. The percentage components of each classification is given in table 2.

States

Pennsylvania had the largest number of plants, 830, while New York had the most persons served, 15,362,000. Because of extreme variations, no attempt is made to analyze percentage distributions of either plants or population served within States. It may be observed, however, that all political entities except the Virgin Islands report purification plants, all except the District of Columbia have simple disinfection and all but 10 have plants employing water softening, either alone or in combination with some other process.

Population Size Groups

Treatment facilities, based on the size of the community in which they are located, show definite patterns of practice. Table 21 shows percentage distributions of numbers of plants and population served by functional class in each of the eight population groups. Purification plants—including those which combine this function with some other—increased percentagewise as did the size of the community. In the smallest places plants in this treatment category comprise less than 10 percent of all treatment facilities, while in the largest, they make up nearly 52 percent of the total. The same pattern follows for population served—going from 12 percent to almost 60 percent. Disinfection alone or combined with some minor process takes almost the opposite pattern. More than two plants out of three in small places are in this category and water thus treated serves two out of three recipients of treated water. The correlated percentages drop to 41 percent of plants and 32 percent of persons served in the 50,000 to 100,000 population grouping. In the over 100,000 group both percentages increase. This increase reflects the use of new small facilities to support larger, older plants, and is quite noticeable when the 42.3 percent of all plants in 1963 is compared to the 30.4 percent of all plants in 1958. That the plants are small is shown by the fact that 35.6 percent of the population receiving treated water was served by this type of facility in 1963 as compared to 37.1 percent 5 years earlier. Softening as part of the treatment process tends to increase both as to plant numbers and population served as the size of the community increases, while iron and manganese removal plants tend to the reverse direction, although in neither is the pattern so strong as in the purification or disinfection classifications.

Drainage Basins

The prevalence of purification plants is highest in the arc swinging from Western Pennsylvania through Tennessee, Alabama, and up into Virginia. This takes in four of the six drainage basins east of the Mississippi and the Western Great Lakes basins (table 22). Here, more than one plant in

TABLE 21. *Percent of total plants and population served for each type* of treatment—within population groups*

NUMBER OF PLANTS—PERCENT

Type plant	Less than 500	500–1,000	1,000–5,000	5,000–10,000	10,000–25,000	25,000–50,000	50,000–100,000	More than 100,000	Total
Purification	8.9	13.3	21.3	28.1	33.7	30.7	43.4	41.3	20.4
Purification and softening	.2	.9	2.2	2.9	5.3	7.1	4.1	9.2	2.3
Purification and iron and manganese removal	.3	.6	.5	1.2	.7	2.1	1.0	.7	.6
Purification, softening and iron and manganese removal	.1	.3	.4	.7	.6	1.0	1.0	.7	.4
Softening	1.3	3.3	4.0	2.8	3.2	3.1	1.0	1.0	3.0
Iron and manganese removal	12.4	12.9	9.4	6.8	7.4	5.5	5.1	2.7	9.8
Softening iron and manganese removal	1.2	3.8	3.9	4.0	3.0	2.9	2.6	1.4	3.2
Disinfection alone	58.6	48.5	38.9	33.5	27.6	24.0	24.5	30.0	41.9
Disinfection with miscellaneous	10.1	10.7	14.1	15.7	15.5	21.0	16.3	12.3	13.2
Miscellaneous	6.7	5.4	5.4	4.3	2.8	2.4	1.0	.3	5.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

ESTIMATED POPULATION SERVED—PERCENT

Purification	11.5	15.0	27.3	34.4	38.8	37.8	51.3	44.4	41.2
Purification and softening	.3	1.1	2.2	3.3	6.3	7.4	5.4	13.5	9.7
Purification and iron and manganese removal	.3	.6	.5	1.2	.7	2.0	1.1	.6	.8
Purification, softening and iron and manganese removal	.1	.4	.4	.7	.9	1.1	1.9	1.2	1.1
Softening	1.2	3.2	3.6	3.1	3.1	3.5	1.4	.9	1.8
Iron and manganese removal	11.6	11.7	8.5	6.4	7.1	4.6	3.9	2.3	4.1
Softening iron and manganese removal	1.1	3.5	3.5	4.3	2.8	3.2	2.5	1.1	2.1
Disinfection alone	56.2	47.7	33.8	27.0	22.6	16.8	15.0	22.5	23.0
Disinfection with miscellaneous	9.9	11.8	15.3	15.5	15.6	21.0	17.4	13.1	14.7
Miscellaneous	7.7	5.0	4.7	4.0	2.1	2.5	Neg.	.2	1.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Based on primary function or functions. Components may not add to 100.0 due to rounding.

TABLE 22. *Percent of total plants and population served for each type* of treatment—within drainage basins*

NUMBER OF PLANTS—PERCENT

Type Plant	(1) Northeast	(2) North Atlantic	(3) Southeast	(4) Tennessee River	(5) Ohio River	(6) Lake Erie	(7) Upper Mississippi	(8) Western Great Lakes	(9) Missouri River	(10) Southwest Lower Mississippi	(11) Colorado River	(12) Western Gulf	(13) Pacific Northwest	(14) California	(15) Great Basin	(16) Alaska	(17) Hawaii	(18) Puerto Rico	(19) Virgin Islands
Purification	17.3	18.1	28.2	37.0	31.1	20.5	9.2	21.1	19.5	20.6	22.0	18.5	10.1	14.0	10.2	8.3	26.7	57.1	.....
Purification and softening	.3	.7	.5	.4	3.6	18.1	2.6	3.6	3.4	4.9	1.2	2.5	.....	.6	1.6	.....	.....	.....	.....
Purification and iron and manganese removal	.2	.2	.9	.4	.8	.6	.4	.3	.7	1.6	.....	1.4	.....	.4	.....	4.2	.....	.....	.....
Purification, softening and iron and manganese removal	.....	.....	.6	.....	.5	.....	1.2	.....	.7	.8	.....	.3	.....	.....	.....	.....	.....	.....	.....
Softening	.5	.9	2.8	.7	6.8	14.5	5.4	4.2	3.9	1.8	1.2	1.0	.4	.6	.....	4.2	.....	.....	.....
Iron and manganese removal	4.6	6.3	7.6	4.0	12.1	8.4	25.7	10.5	15.0	9.5	.....	3.0	.6	2.7	.....	.....	.....	.....	.....
Softening iron and manganese removal	.5	.6	2.6	.....	4.4	7.8	10.3	4.4	4.0	3.3	.....	.....	.....	.....	.....	.....	.....	.....	.....
Disinfection alone	50.7	62.1	29.7	46.9	29.4	18.7	19.1	23.8	43.5	44.5	65.3	56.3	71.7	60.3	71.7	83.3	60.6	11.4	100.0
Disinfection with miscellaneous	19.1	9.4	21.9	9.9	9.5	6.6	11.1	21.6	8.2	10.6	9.8	12.6	13.2	16.4	13.4	.....	10.0	30.0	.....
Miscellaneous	6.7	1.7	5.2	.7	1.7	4.8	15.0	10.5	1.1	2.3	.6	4.5	3.8	4.5	1.6	.....	3.3	.....	.....
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

ESTIMATED POPULATION SERVED—PERCENT

Purification	25.3	72.9	50.6	66.1	56.2	66.9	23.2	74.5	34.0	29.0	56.4	34.3	10.9	23.5	47.3	12.7	2.5	71.5	.....
Purification and softening	.1	.6	2.7	.2	15.3	26.4	19.0	6.3	28.5	21.7	.5	9.8	.....	18.9	2.7	.....	.....	.....	.....
Purification and iron and manganese removal	.1	.1	2.0	.1	.8	.2	3.0	.1	.2	.9	.....	2.0	.....	.4	.....	13.8	.....	.....	.....
Purification, softening and iron and manganese removal	.....	.....	.9	.....	.4	.....	2.0	.....	3.2	.6	.....	11.0	.....	.....	.....	.....	.....	.....	.....
Softening	.1	.2	3.8	.1	5.4	2.0	3.2	.9	2.4	5.4	.3	.4	.1	.6	.....	1.9	.....	.....	.....
Iron and manganese removal	4.8	3.2	3.3	1.5	5.8	.3	7.6	1.5	6.5	12.7	.....	.6	.2	1.5	.....	.....	.....	.....	.....
Softening iron and manganese removal	.1	.2	9.5	.....	2.0	2.2	3.7	2.3	6.2	2.7	.....	.....	.....	.....	.....	.....	.....	.....	.....
Disinfection alone	51.1	15.7	8.6	15.8	7.8	1.0	7.3	3.9	11.5	20.2	35.8	30.7	31.3	32.1	40.4	71.6	93.1	12.7	100.0
Disinfection with miscellaneous	16.0	6.4	17.3	16.1	5.0	.7	7.3	9.5	7.2	6.5	7.8	10.9	55.6	22.3	9.5	.....	4.2	15.5	.....
Miscellaneous	2.0	.6	1.3	.2	1.2	.2	3.9	1.0	.3	.3	.1	.3	1.8	.6	.1	.....	.2	.....	.....
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Based on primary function or functions. Components may not add to 100.0 due to rounding.

three has filtration as one of its functions. East of the arc—from Virginia to Maine, the ratio is 1 in 5. West of the arc, to the Rocky Mountains and the Southwest, except the Upper Mississippi, the ratio is 1 in 4. From the Rockies to the West Coast the ratio is 1 in 7 or 10. As related to population served, this filtration pattern is not repeated. The highest percentages of population receiving filtered water are in the areas of the Great Lakes, Ohio-Tennessee Valleys, and North Atlantic coastal States, where the basin percentages range from 66 to 94 percent. Northeastward in New York and New England, the figure is 26 percent. Surrounding the high core and west to the Rockies and Arizona, the figures are between 47 and 60 percent. California, Nevada, and Western Utah are between 43 and 50 percent. In the Pacific Northwest only one person in nine of those receiving treated water is served filtered water.

The pattern for disinfection with or without some further miscellaneous treatment action is almost the reverse of that for water purification. The low points in the disinfection category are in the Great Lakes, Upper Mississippi, and Ohio Valleys, with a rim on all sides rising to a high of 85 percent of all plants in the Pacific Northwest. Population percentages follow the same pattern. In the Lake Erie Basin only 2 percent of the population received treated water with disinfection as the major function. In the Pacific Northwest this figure was 87 percent.

No clear pattern of the use of softening of iron removal plants can be discerned, except to say the percentages for both are higher in the Great Lakes, Ohio Valley, and the Plains States. The same is true for population served.

Basin by basin comparisons of the 1958 and 1963 statistics should be approached with caution. The boundary lines between the Northeast and North Atlantic Basins have been shifted so that all of Metropolitan New York and the east coast of New Jersey are now considered in the Northeast Basin.

Unit Processes

General

Tables 12 and 13 summarize data on various unit processes found in U.S. water facilities. These data represent unit processes which occur frequently in practice and for this reason have been selected. Process details have been tabulated but are not shown in this summary.

Disinfection

In 1963 there were 10,405 water treatment plants serving 134,068,000 persons with water which was disinfected at some stage of the treatment process. This is an increase of 17.6 percent over 1958 of plants employing disinfection. The population served water thus processed was 96.2 percent of all recipients of treated water and 89.0 percent of the people who are served by municipal facilities.

These figures show that disinfection is the largest single unit process in use in the U.S. water facilities. The term disinfection usually means the use of chlorine in some form. As seen in table 3 only 33 of the 10,405 plants using a disinfectant definitely stated the use of some agent other than chlorine.

Liquid chlorine was used in 5,929 plants serving almost 102 million people. This is an increase of 811 plants or 15.8 percent over 1958. Hypochlorites were used in 3,873 plants which is an increase over 1958 of 844 or 27.9 percent. Chloramine procedures were reported in only 308 plants as compared to 404 five years earlier, a decline of 96 plants or 23.8 percent. The population so served declined 18.1 percent.

In 25 States more than 90 percent of the population served by water facilities is served disinfected water. Kansas with 99.5 percent of the population served being served disinfected water leads the list of States, while Arizona with 28.3 is the lowest. In the District of Columbia and the Virgin Islands all persons were served disinfected water. In Puerto Rico 99.6 percent of the population served received disinfected water.

The national average of 89.0 percent of population served receiving disinfected water is exceeded only in the three largest population groups (table 23). Even so, these group percentages are under those for 1958 because of new ground water supplies being brought in for the larger places, not all of which are disinfected. Fair percentage rises are seen for the three smallest population groups, which nevertheless show 7,677 or 86.9 percent of the facilities without disinfection. Of these, 6,650 have no treatment at all and 1,027 have some type of treatment other than disinfection.

TABLE 23. *Percent of population served by water supplies receiving disinfected water—by population groups*

	Percent of total population served
Less than 500	41.2
500–1,000	54.6
1,000–5,000	70.4
5,000–10,000	78.8
10,000–25,000	84.9
25,000–50,000	89.6
50,000–100,000	90.2
More than 100,000	96.8
Total	89.0

Reference to table 12 discloses the differences in treatment practices among the States. Liquid chlorine is the agent most commonly used. Chloramine exceeds liquid chlorine as to population served in only eight States, and then only by relatively small margins. In no instance does it exceed as to number of plants.

TABLE 24. *Percent of plants and population served by various types of disinfecting agents—within population groups*

Type disinfecting agent	Less than 500	500–1,000	1,000–5,000	5,000–10,000	10,000–25,000	25,000–50,000	50,000–100,000	More than 100,000	Total
	(POPULATION GROUPS)								
	Number of plants—Percent								
Ammonia—chlorine	0.2	0.1	1.5	4.7	7.5	10.4	17.2	18.1	3.0
Liquid chlorine	26.6	41.6	64.8	76.6	79.5	76.3	65.1	72.9	57.0
Hypochlorite	71.5	55.8	30.6	16.0	9.5	8.6	12.5	5.6	37.2
Both liquid chlorine and hypochlorite	.6	1.2	2.6	2.3	2.8	2.7	2.6	1.4	1.9
Chlorine dioxide	<.1	.1	.0	.0	.1	.0	1.0	.7	<.1
Ozone	.0	<.1	.0	.0	.0	.0	.0	.0	<.1
Others	.6	.5	.2	.2	.1	.0	.0	.7	.3
Unspecified	.5	.6	.4	.3	.6	2.0	1.6	1.0	.5
Total*	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Estimated population served—Percent								
Ammonia—chlorine	0.4	0.3	2.6	6.9	9.2	13.3	25.4	21.7	17.2
Liquid chlorine	33.3	47.9	72.4	81.9	82.0	78.3	66.7	76.5	75.8
Hypochlorite	63.5	49.2	21.3	8.0	5.5	3.9	3.2	.6	4.6
Both liquid chlorine and hypochlorite	1.3	1.2	3.1	2.9	2.6	2.6	2.4	.5	1.4
Chlorine dioxide	<.1	<.1	.0	.0	<.1	.0	.9	.6	.4
Ozone	.0	<.1	.0	.0	.0	.0	.0	.0	<.1
Others	.4	.5	.3	.2	.1	.0	.6	.3	.2
Unspecified	.6	.8	.4	.3	.6	1.9	1.4	.2	.5
Total*	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Components may not add to 100.0 because more than one agent may be used.

Table 24 shows the percentage of plants and population served in population size groups for each disinfecting agent. Hypochlorites are used in the majority of plants in places under 1,000 population but the percentages decrease sharply as the size of community increases, dropping to 5.6 percent of plants using disinfection in the largest cities. As to population served, the pattern is the same but even more pronounced, dropping from 63.5 percent in the smallest size group to 0.6 in the largest. Chlorine-ammonia takes just the opposite pattern, rising from less than 1 percent in both plants and population categories to approximately 20.0 percent. Liquid chlorine of course is the disinfecting agent that really dominates the water treatment field, especially in places of greater than 1,000 population.

On a geographic basis, as table 25 shows, liquid chlorine is used in more plants than any other agent in all drainage basins except three, the Northeast, North Atlantic, and Missouri River, where it was exceeded slightly by hypochlorites. Only in the Pacific Northwest was liquid chlorine in a minority as to population served; here it was exceeded by ammonia chlorine. In all others of the conterminous basins it ranged from 60.8 percent in the Upper Mississippi to 92.3 percent of the population in the Tennessee River basin.

TABLE 25. *Percent of plants and population served by various types of disinfecting agents—within drainage basins*

MAJOR DRAINAGE BASINS

Type disinfecting plant	(1) Northeast	(2) North Atlantic	(3) Southeast	(4) Tennessee River	(5) Ohio River	(6) Lake Erie	(7) Upper Mississippi	(8) Western Great Lakes	(9) Missouri River	(10) Southwest Lower Mississippi	(11) Colorado River	(12) Western Gulf	(13) Pacific Northwest	(14) California	(15) Great Basin	(16) Alaska	(17) Hawaii	(18) Puerto Rico	(19) Virgin Islands	Total
	Number of plants—Percent																			
Ammonia—chlorine	3.0	2.5	3.2	0.7	3.1	7.3	3.4	7.5	3.7	2.5	2.3	0.7	4.9	0.7	4.1	.0	.0	.0	.0	3.0
Liquid chlorine	45.4	42.1	63.4	69.0	63.7	57.7	57.0	60.1	46.8	58.7	50.3	71.9	51.9	71.0	55.7	57.1	65.4	59.4	100.0	57.0
Hypochlorite	47.8	51.3	32.1	27.7	30.9	32.1	37.8	29.7	47.5	36.9	44.4	23.4	41.2	23.2	32.0	42.9	26.9	24.6	.0	37.2
Both liquid chlorine and hypochlorite	3.1	3.7	.8	2.2	1.4	2.2	1.0	2.4	1.7	1.1	.6	2.0	1.8	4.2	.0	.0	7.7	2.9	.0	1.9
Chlorine dioxide	<.1	.1	.0	.0	.3	.7	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	<.1
Ozone	<.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	<.1
Other	<.1	.0	<.1	.4	.3	.0	.5	.0	.1	.4	1.8	1.0	.2	.4	1.6	.0	.0	.0	.0	.3
Unspecified	.4	.2	.4	.0	.5	.0	.3	.3	.1	.6	.6	.9	.0	.7	6.6	.0	.0	13.0	.0	.5
Total*	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Estimated population served—Percent																			
Ammonia—chlorine	10.2	11.8	14.8	2.9	21.8	32.0	35.5	25.5	22.9	16.4	6.3	13.0	50.9	2.9	6.5	.0	.0	.0	.0	17.2
Liquid chlorine	81.0	78.3	79.2	92.3	70.7	64.8	60.8	71.6	69.8	78.1	82.9	82.0	43.9	91.0	70.0	90.8	89.7	63.0	100.0	75.8
Hypochlorite	5.7	6.8	3.9	3.6	3.7	1.3	3.0	1.9	5.9	4.7	8.5	2.5	4.1	4.3	12.9	9.2	.8	17.8	.0	4.6
Both liquid chlorine and hypochlorite	2.8	2.8	.6	1.2	.5	.2	.4	1.0	1.4	.5	<.1	.7	1.1	1.7	.0	.0	9.5	1.0	.0	1.4
Chlorine dioxide	<.1	.3	.0	.0	3.2	1.7	<.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.4
Ozone	<.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	<.1
Other	<.1	.0	<.1	<.1	.2	.0	1.3	.0	<.1	<.1	.1	1.0	<.1	<.1	.2	.0	.0	.0	.0	.2
Unspecified	.3	<.1	.6	.0	.1	.0	.2	<.1	<.1	.3	2.2	.7	.0	.1	10.3	.0	.0	18.1	.0	.5
Total*	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Components may not add to 100.0 because more than one agent may be used.

Table 26 shows the use of disinfecting agents in treatment plants by States from 1948 to 1963 and total use from 1940 to date. Table 27 shows the number and percent change between 1958 and 1963. Only three States showed a net decrease in the total number of plants, Oklahoma by one, Rhode Island by three, and West Virginia by seven. Liquid chlorine was reported in fewer plants in 11 States and hypochlorites were used in fewer plants in 15 States. Ammonia-chlorine, on the other hand, showed a use increase in only five States. The remainder of those previously reporting the use of this agent either remained the same (16) or declined (24), so that less than half the number of plants now use ammonia-chlorine as were using it 15 years ago.

Filtration

Rapid sand filtration was reported in use at 2,738 plants serving populations of over 70 million. All States were represented. Ohio, with 220, had the largest number of such plants and also the greatest number of persons served with this type of treatment. The Ohio River basin, with 613, had the largest number of such plants among the major drainage basins. Table 28 shows the percentage by population size group and basin. This type of plant is not widely used in the smaller places. Table 13 shows that pressure sand filters perform some of the purification functions in these places. Almost 88 percent of the 1,027 pressure sand filters are in places of under 5,000 population. However, only in the group under 500 do they outnumber gravity sand filters. Slow sand filters are found in 184 plants, considerably more than the 106 in 1958, but the population thus served is only about two-thirds of the figure 5 years earlier. Filters using anthracite increased from 330 to 398. Half of these were in places of under 5,000 population. All of them served slightly over 8 million people. Iowa had the greatest number, 40, only 1 of which was in a place of greater than 10,000 population. All 40 were classified as iron removal plants serving ground water. Pennsylvania was second in number with 35, but had the largest population served, 1,166,000. Diatomaceous earth was reported used in only 52 instances and such filters served only 617,000 people. Two-thirds of these people are in California.

Table 28 shows that rapid sand (gravity) filtration increases in use as the size of the community increases—ranging from less than 10 to nearly 50 percent with the overall frequency being 23.6. This trend is true also for population served. Over half (50.8 percent) of the persons receiving treated water are served by plants using rapid sand filters. Table 29 presents the background numbers of purification plants from 1924 to date, showing a continued expansion. Table 30 shows the population served by rapid and slow sand filters since 1870. The figures are not necessarily mutually exclusive because some installations may have more than one type.

TABLE 26. *Comparison of number of plants in 1940, 1948, 1958, and 1963 having disinfection, and by various methods in 1948, 1958, and 1963*

State	Total				Liquid chlorine			Hypochlorite			Ammonia chlorine			Liquid chlorine and hypochlorite			Other and not stated		
	1940	1948	1958	1963	1948	1958	1963	1948	1958	1963	1948	1958	1963	1948	1958	1963	1948	1958	1963
Alabama	162	187	230	263	87	90	119	99	138	143	1	1	1		1				
Alaska [1]			17	21		9	12		8	9									
Arizona	23	44	54	56	20	25	34	19	27	18									
Arkansas	59	80	142	159	60	101	95	14	36	59	4	2	2				1		2
California	120	150	381	484	41	287	347	6	54	109	5	3	3		1	1	1	1	1
Colorado	34	56	148	189	44	82	94	9	54	71	25	8	5		10	19	78	22	5
Connecticut	73	88	94	100	56	54	51	26	30	41		11	12						
Delaware	3	6	22	24	6	19	20		2	4	6	3	2		2	6	3	1	6
District of Columbia	2	2	2	2		2	2					1						5	
Florida	46	130	304	328	75	171	212	25	117	102	2								
Georgia	155	189	183	239	127	132	159	42	39	67	22	10	6		6	6	8		2
Hawaii [1]			22	26		10	17		10	7	19	10	8			1	1	2	4
Idaho	19	52	63	57	29	41	44	18	19	20	5	2	2		2	2			
Illinois	193	252	461	569	174	273	343	39	165	198	37	14	15		1	1			
Indiana	183	248	305	348	164	216	259	61	73	79	21	10	12		7	5	2	2	10
Iowa	111	183	273	327	90	102	131	78	156	189	8	5	4		5	7	2	1	
Kansas	84	181	385	485	78	117	142	75	237	323	24	13	4	1	3	1	7	4	2
Kentucky	170	182	223	235	121	154	159	24	43	52	23	19	17		17	16	3	1	
Louisiana	36	79	145	151	50	107	115	22	29	28	7	9	8		3	3	14	4	4
Maine	96	101	111	114	47	46	34	32	42	61	21	19	7	1	3	11		1	1
Maryland	42	63	91	138	24	37	58	30	45	73	5	4	4	3	4	2	1	1	1
Massachusetts	70	90	97	113	57	73	71	13	23	40	16	1					4		2
Michigan	92	121	153	180	75	103	112	28	44	61	16	3	3		1	3	2	2	1
Minnesota	42	71	109	160	37	55	110	14	41	36	20	13	14						
Mississippi	25	54	69	122	26	43	91	21	25	29	4	1	1			1	3		
Missouri	107	129	180	222	104	96	176	7	73	37	16	7	9		2		2	2	
Montana	46	48	91	92	24	43	34	9	31	42	14	16	14		1	2	1		
Nebraska	19	16	19	35	7	9	27	2	9	7	3	1	1						
Nevada	8	11	18	26	6	9	14	2	3	3	2	1					4		
New Hampshire	33	39	55	71	18	17	16	21	37	54					1	1	1	5	9
New Jersey	143	193	221	283	72	96	145	52	70	109	36	22	14	5	10	14	28	23	1
New Mexico	14	35	79	79	21	44	41	14	30	32					3	2		2	4
New York	407	453	454	582	228	262	273	109	133	278	85	41	14	4	7	12	27	11	5
North Carolina	147	173	220	233	116	149	165	26	54	53	31	13	13		3	2		1	
North Dakota	14	16	27	64	9	12	25		7	32	7	6	6		1			1	1

Ohio	142	211	300	340	131	169	182	56	109	136	22	18	17	1	4	4	1	.....	1
Oklahoma	103	129	240	239	88	126	131	25	101	95	16	7	7	.....	2	1	.....	4	5
Oregon	85	138	165	209	66	80	94	50	74	102	19	10	8	1	.....	4	.....	1	1
Pennsylvania	596	638	691	819	372	368	328	185	240	432	49	31	24	12	31	32	20	21	3
Puerto Rico [1]	.....	.....	62	69	.....	47	41	.....	12	17	.....	.....	.....	.....	2	2	.....	1	9
Rhode Island	17	25	30	27	7	9	9	15	21	18	3	.....	.....	.....	.....	.....	.....	.....	.....
South Carolina	49	81	85	90	66	64	75	5	8	6	9	12	9	.....	.....	.....	1	1	.....
South Dakota	29	52	87	93	32	41	53	12	39	32	8	6	6	.....	1	2	.....	.....	.....
Tennessee	117	141	219	246	103	162	193	25	49	47	12	1	1	.....	4	4	1	3	1
Texas	191	318	578	691	243	408	512	61	156	152	12	10	6	.....	3	13	2	1	9
Utah	22	20	92	97	13	52	42	.....	27	51	6	6	2	.....	2	.....	1	5	2
Vermont	6	23	55	58	15	22	24	8	33	34	.....	.....	.....	.....	.....	.....	.....	.....	.....
Virginia	152	190	221	224	103	122	124	73	89	92	11	3	3	2	6	5	1	1	.....
Virgin Islands [1]	.....	.....	.....	3	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington	89	121	139	154	61	74	87	39	49	56	19	13	9	2	2	2	.....	1	.....
West Virginia	202	234	283	276	162	195	195	51	72	66	14	8	7	3	3	3	4	5	6
Wisconsin	59	68	103	124	40	58	66	13	32	45	13	9	7	2	3	6	.....	1	.....
Wyoming	13	26	47	59	16	35	32	2	11	26	4	1	1	.....	.....	.....	4	.....	.....
Total	4,650	6,137	8,845	10,405	3,613	5,118	5,929	1,557	3,029	3,873	702	404	308	37	157	202	228	137	98

Note: Data need not cross-add because more than one agent may be used in the same plant.

[1] Figures not reported in 1940 and 1948.

TABLE 27. *Change in number of plants and percent increase or decrease between 1959 and 1963 for various disinfection methods*

State	Total		Liquid chlorine		Hypochlorite		Ammonia chlorine	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Alabama	33	14.4	29	32.2	5	3.6	0	0.0
Alaska	4	23.5	3	33.3	1	12.5		
Arizona	2	3.7	9	36.0	−9	−33.3		
Arkansas	17	12.0	−6	−5.9	23	63.9	0	.0
California	103	27.0	60	20.9	55	101.9	−3	−37.5
Colorado	41	27.7	12	14.6	17	31.5	1	9.1
Connecticut	6	6.4	−3	−5.6	11	36.7	−1	−33.3
Delaware	2	9.1	1	5.3	2	100.0	−1	−100.0
District of Columbia	0	.0	0	.0				
Florida	24	7.9	41	24.0	−15	−12.8	−4	−40.0
Georgia	56	30.6	27	20.5	28	71.8	−2	−20.0
Hawaii	4	18.2	7	70.0	−3	−30.0		
Idaho	4	5.3	3	7.3	1	5.3	0	.0
Illinois	108	23.4	70	25.6	33	20.0	1	7.1
Indiana	43	14.1	34	15.7	6	8.2	2	20.0
Iowa	54	19.8	29	28.4	30	18.9	−1	−20.0
Kansas	100	26.0	25	21.4	86	36.3	−9	−69.2
Kentucky	12	5.4	5	3.2	9	20.9	−2	−10.5
Louisiana	6	4.1	8	7.5	−1	−3.4	−1	−11.1
Maine	3	2.7	−12	−26.1	19	45.2	−12	−63.2
Maryland	47	51.6	21	56.8	28	62.2	0	.0
Massachusetts	16	16.5	−2	−2.7	17	73.9	−1	−100.0
Michigan	27	17.6	9	8.7	17	38.6	0	.0
Minnesota	51	46.8	55	100.0	−5	−12.2	1	7.7
Mississippi	53	76.8	48	111.6	4	16.0	0	.0
Missouri	42	23.3	80	83.3	−36	−49.3	2	28.6
Montana	1	1.1	−9	−20.9	11	35.5	−2	−12.5
Nebraska	16	84.2	18	200.0	−2	−22.2	0	.0
Nevada	8	44.4	5	55.6	0	.0	−1	−100.0
New Hampshire	16	29.1	−1	−5.9	17	45.9	0	.0
New Jersey	62	28.1	49	51.0	39	55.7	−8	−36.4
New Mexico	0	.0	−3	−6.8	2	6.7	0	.0
New York	128	28.2	11	4.2	145	109.0	−27	−65.9
North Carolina	13	5.9	16	10.7	−1	−1.9	0	.0
North Dakota	37	37.0	13	108.3	25	357.1	0	.0
Ohio	40	13.3	13	7.7	27	24.8	−1	−5.6
Oklahoma	−1	−.4	5	4.0	−6	−5.9	0	.0
Oregon	44	26.7	14	17.5	28	37.8	−2	−20.0
Pennsylvania	128	18.5	−40	−10.9	192	80.0	−7	−22.6
Puerto Rico	7	11.3	−6	−12.8	5	41.7		
Rhode Island	−3	−10.0	0	.0	−3	−14.3		
South Carolina	5	5.9	11	17.2	−2	−25.0	−3	−25.0
South Dakota	6	6.9	12	29.3	−7	−17.9	0	.0
Tennessee	27	12.3	31	19.1	−2	−4.1	0	.0
Texas	113	19.6	104	25.5	−4	−2.6	−4	−40.0
Utah	5	5.4	−10	−19.2	24	88.9	−4	−66.7
Vermont	3	5.5	2	9.1	1	3.0		
Virginia	3	1.4	2	1.6	3	3.4	0	.0
Virgin Islands	3	(1)	3	(1)				
Washington	15	10.8	13	17.6	7	14.3	−4	−30.8
West Virginia	−7	−3.5	0	.0	−6	−8.3	−1	−12.5
Wisconsin	21	20.4	8	13.8	13	40.6	−2	−22.2
Wyoming	12	25.5	−3	−8.6	15	136.4	0	.0
Total	1,560	17.6	811	15.8	844	27.9	−96	−23.8

[1] Not calculable since 1958 base is zero.

TABLE 28. *Percentage of all treatment plants having various unit processes—arranged by population groups and major basins*

Population groups	Proportion of all treatment plants having—							
	Gravity rapid-sand filter		Aeration		Taste and odor control		Corrosion control	
	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served	Number of facilities	Population served
Less than 500	8.8	11.0	18.4	17.0	1.5	1.2	12.6	13.2
500–1,000	14.9	16.1	23.4	21.8	4.2	4.7	18.5	19.0
1,000–5,000	25.0	30.0	23.7	23.2	8.8	12.2	22.8	26.0
5,000–10,000	33.9	39.0	22.9	23.8	16.9	20.3	26.1	29.9
10,000–25,000	38.0	43.2	22.6	24.5	22.7	26.0	31.4	34.4
25,000–50,000	40.0	45.0	23.1	24.8	28.3	36.7	40.7	44.9
50,000–100,000	48.0	60.6	20.9	22.0	35.2	47.3	42.9	47.1
More than 100,000	49.5	57.4	15.7	9.4	34.5	40.7	33.8	33.5
MAJOR BASINS								
Northeast	12.1	19.6	14.5	14.0	9.1	16.0	26.4	28.5
North Atlantic	16.2	67.4	11.7	13.9	9.9	52.9	18.1	67.0
Southeast	29.7	58.1	27.4	24.3	10.3	30.9	40.4	55.2
Tennessee River	34.4	61.3	11.0	4.5	3.7	23.1	23.1	57.7
Ohio River	38.4	70.1	27.1	26.1	16.2	55.8	23.3	41.6
Lake Erie	43.4	90.1	31.3	4.0	25.9	87.9	28.3	42.1
Upper Mississippi	20.3	51.4	41.6	13.3	8.3	32.6	31.5	29.5
Western Great Lakes	26.9	82.1	16.3	5.7	12.7	74.1	29.6	13.9
Missouri River	28.8	68.5.	29.5	22.4	9.8	37.9	11.9	35.6
Southwest-Lower Mississippi	27.8	56.9	25.2	30.4	13.2	32.1	18.4	36.3
Colorado River	14.5	50.8	1.7	1.3	5.2	37.2	1.2	.7
Western Gulf	16.2	55.3	17.0	16.1	7.8	37.9	7.4	24.4
Pacific Northwest	6.3	6.8	2.3	5.2	5.7	29.1	5.0	9.5
California	13.4	38.3	11.1	10.0	6.0	6.5	15.2	18.8
Great Basin	8.7	38.5	4.7	1.7	5.5	20.7	5.5	7.7
Alaska	4.2	.1						
Hawaii	16.7	1.6	6.7	4.2	3.3	.2	6.7	4.7
Puerto Rico	55.7	71.1	7.1	27.0	4.3	22.6	50.0	59.5
Virgin Islands								
Total	23.6	50.8	22.3	15.8	10.3	35.1	22.4	34.8

Softening

Softened water was furnished to 20,260,000 people through 1,037 plants. This is a 4.6 percent increase in the number of softening plants and a 12.6 percent increase in population thus served. These figures relate to plants which employed softening processes alone or in combination with other treatment measures. Two of the most common processes were lime-soda and zeolite as shown in table 13. Other processes in use included lime alone or in combination with some chemical other than soda ash, and some did not indicate that any lime was used. Zeolite filters were most often used in the smaller communities where they outnumbered lime-soda two to one in places of under 5,000 population.

TABLE 29. *Number of purification plants of all types in 1924, 1930, 1940, 1948, 1958, and 1963*

States	1924[1]	1930[2]	1940[3]	1948	1958	1963
Alabama	13	48	65	72	79	80
Alaska					2	3
Arizona	0	2	3	7	7	10
Arkansas	11	28	30	36	47	52
California	9	19	38	40	56	79
Colorado	6	15	25	31	39	59
Connecticut	5	15	26	27	23	21
Delaware	2	1	3	3	2	9
District of Columbia	1	2	2	2	2	2
Florida	3	23	15	21	18	23
Georgia	13	50	74	79	89	92
Hawaii					6	8
Idaho	1	4	3	6	5	5
Illinois	33	77	104	113	121	142
Indiana	19	31	41	46	47	59
Iowa	12	24	33	35	34	36
Kansas	14	50	57	60	73	87
Kentucky	14	45	99	110	150	152
Louisiana	5	11	22	29	46	54
Maine	9	15	18	20	21	20
Maryland	10	13	16	16	17	28
Massachusetts	8	19	26	27	22	25
Michigan	18	28	42	43	51	52
Minnesota	9	19	18	19	26	29
Mississippi	4	9	4	4	6	7
Missouri	14	58	75	73	125	120
Montana	5	11	10	10	13	16
Nebraska	1	8	7	7	8	6
Nevada	0	0	3	6	2	3
New Hampshire	2	12	10	10	3	5
New Jersey	19	47	33	37	33	35
New Mexico	0	5	3	4	13	15
New York	39	96	126	136	130	136
North Carolina	43	86	96	106	118	124
North Dakota	5	6	11	13	21	25
Ohio	46	98	86	97	134	141
Oklahoma	25	56	68	73	96	103
Oregon	4	17	15	18	20	20
Pennsylvania	86	196	193	180	194	200
Puerto Rico					33	40
Rhode Island	5	8	8	9	9	10
South Carolina	16	29	40	58	67	66
South Dakota	3	8	8	11	14	10
Tennessee	13	36	37	48	79	96
Texas	23	47	73	94	160	183
Utah	0	2	3	2	12	12
Vermont	2	2	3	4	5	5
Virginia	26	72	59	71	85	83
Virgin Islands						0
Washington	7	9	8	14	17	14
West Virginia	22	51	91	99	108	114
Wisconsin	9	18	17	19	21	21
Wyoming	4	5	8	9	8	14
Total	638	1,531	1,855	2,054	2,517	2,760

[1] Data from Gillespie (*11*).
[2] Data from Streeter (*12*). These figures have been summarized from the basic data accompanying the summary report.
[3] Data from Weibel (*6*). These data include plants enumerated in the footnotes, but not shown in the tables.

TABLE 30. *Total population served by slow and rapid sand type purification plants—1870 to 1963*

Year	Slow sand purification plants	Rapid sand purification plants
1870 [1]	None	None
1880	30,000	None
1890	35,000	275,000
1900	360,000	1,500,000
1904	560,000	2,600,000
1910	3,883,000	6,922,000
1914	5,398,000	11,893,000
1924 [2]	5,054,000	18,610,000
1948	3,539,035	39,137,710
1958	6,233,620	58,873,415
1963	3,950,875	70,203,885

[1] Data for 1870 to 1914 inclusive from Alvord, John W. Recent progress and tendencies in municipal water supply practice in the United States (*9*).
[2] From: Gillespie, C. G. Census of water filtration plants—1924 (*11*). This tabulation lists plants of 1.0 MGD capacity or larger.

Almost two-thirds of the zeolite filters are located in the Ohio and Upper Mississippi Basins. The State of Ohio reported the lime-soda process in 105 plants serving 2,683,000. Pennsylvania had 1,936,000 persons receiving lime-soda softened water, Texas 1,121,000, Kentucky 764,000, and Michigan 596,000. No other State had as many as 500,000 people thus served, while 14 States, the District of Columbia, Puerto Rico, and the Virgin Islands reported none. An historical presentation of number of all softening plants in the United States is shown in table 31.

TABLE 31. *Number of softening plants for the years 1941, 1944, 1948, 1958, and 1963—arranged by population groups*

Population groups	Number of softening plants				
	1941 [1]	1944 [2]	1948	1958	1963
Less than 1,000	147	194	217	275	244
1,000–5,000	240	272	348	406	446
5,000–10,000	79	88	94	114	121
10,000–50,000	87	87	92	147	173
More than 50,000	23	24	28	49	53
Total	576	665	779	991	1,037

[1] From Olson (*13*).
[2] From Olson (*14*).

Aeration

Aeration as a plant process was used in 2,580 plants, about 22 percent of all treatment facilities. Table 28 shows there is not much difference among population groups but that there are wide geographic differences when viewed on a drainage basin basis. For example, only 1.7 percent of the Colorado River Basin plants use aeration, while 41.6 percent of the plants in the Upper Mississippi Basin employ this process.

Taste and Odor Control

Treatment measures to control taste and odor were taken in 10.3 percent of the plants serving 35.1 percent of the people receiving treated water (table 28). The percentages increase as the size of the community increases. The most extensive use of such measures was in the Lake Erie Basin where 25.9 percent of the plants took this type of action on water served to 87.9 percent of the population receiving treated water. Broken down by States, Pennsylvania had the greatest number of such plants, with 120 of the total 1,199. Pennsylvania also had the largest population served by this type of treatment, slightly over 6 million.

Corrosion Control

Corrosion control was practiced in 2,600 plants, or 22.4 percent of all plants, serving 34.8 percent of the population (table 28). As with taste and odor control the percentages increase with the community size. The Southeast basin had the highest percentage of such plants, 40.4 percent, excluding Puerto Rico. The lowest percentages, under 10, were in the West-Western Gulf, Colorado, the Great Basin, and the Pacific Northwest.

Laboratory Control

Table 13 shows the laboratory status of the 11,590 treatment plants, whether chemical, bacteriological or both. "None" was reported by 6,475 or 55.9 percent. It is pointed out that of these having no laboratory, 83.1 percent were in communities of less than 5,000 population. The laboratory status was not given for 1,344 facilities. Most of these were also in population groups under 5,000.

In Retrospect

For more than 50 years the Public Health Service has been interested in assembling data on water facilities. In 1915 the late R. E. Tarbett, Associate Sanitary Engineer at the Stream Pollution Investigation Office at Cincinnati, brought together, but did not publish, incomplete data on water treatment plants in the United States. The first formal publication of such an inventory by the Public Health Service was that for 1948.

Historically, J. R. R. Croes, C.E., in 1878 began preparation of a series of descriptions of water works of the country so far as he could locate them and get the necessary information for publication in the Engineering News. The statistical matter was gathered and published in book form in 1883, revised and enlarged in 1885 and again in 1887 as "Statistical Tables of American Water-Works." Then in 1888 both the descriptions and tables were issued as the "Manual of American Water Works." It was enlarged and issued again in 1890. A third volume,

issued in 1891 (*7*) under the editorship of M. N. Baker (earlier issues are assumed to be under his editorship also), reports that much of the earlier descriptive material was omitted to make room for statistics showing growth of individual works and reduce the volume size. Nevertheless, the 1891 volume was 1½ inches thick and in very fine print. The descriptions include such data as miles and type of pipe, cost, outstanding debt, interest rates, officers, even the designing engineer and builder. That there was difficulty in getting the information is borne out in the following quote from Baker's third edition mentioned above:

"If the previous records have been in any particular way incomplete, as anyone who has collected similar information knows must be the case, it is not owing to any lack of persistency on our part, as many as a dozen inquiries having been sent to some parties, sometimes with, and sometimes without response.

"While the many who have promptly replied to each inquiry deserve, and have, hearty thanks, it is true that a large number utterly fail to realize two facts:

"First, that for their own interests, the collection and publication of such diversity of information as is given in the (Inventory) saves them, not all, but very large number of inquiries from this and other countries; and

"Second, that the interests of others and the relation which each individual, and water-works, bears to all others, and the public character of the information sought, demands a reasonable response to such solicitations as are made for a (publication like the Inventory)."

One table from the 1891 volume is the source of the 1801–90 portion of table 32 of this publication. It shows only 16 water works in the United States in 1800, listed by Baker as:

City	*Year Built*
Boston, Mass	1652
Bethlehem, Pa	1761
Providence, R.I	1772
Morristown, N.J	1779
Geneva, N.Y	1787
Peabody, Mass	1790
Plymouth, Mass	1796
Worchester, Mass	1796
Hartford, Conn	1797 [1]
Portsmouth, N.H	1798
Salem, Mass	1799
New York, N.Y	1799 [2]
Lynchburg, Va	1799
Newark, N.J	1800
Albany, N.Y	Prior to 1800
Winchester, Va	Prior to 1800

[1] Probable date.
[2] Works started by city in 1774 but stopped by Revolutionary War.

TABLE 32. *Growth in number of waterworks in the United States*

Year	Number of waterworks					Percent of total			
	Public	Private	Both public and private	Not stated	Total	Public	Private	Both public and private	Not stated
Before 1801	1	15	.....	.....	16	6.3	93.7	.....	.....
1805	2	21	.....	.....	23	8.7	91.3	.....	.....
1810	5	21	.....	.....	26	19.2	80.8	.....	.....
1815	5	21	.....	.....	26	19.2	80.8	.....	.....
1820	5	25	.....	.....	30	16.6	83.4	.....	.....
1825	5	27	.....	.....	32	15.6	84.4	.....	.....
1830	9	35	.....	.....	44	20.5	79.5	.....	.....
1835	15	39	.....	.....	54	27.8	72.2	.....	.....
1840	23	41	.....	.....	64	35.9	64.1	.....	.....
1845	27	43	.....	.....	70	38.6	61.4	.....	.....
1850	33	50	.....	.....	83	39.7	60.3	.....	.....
1855	48	58	.....	.....	106	45.3	54.7	.....	.....
1860	57	79	.....	.....	136	41.9	58.1	.....	.....
1865	68	94	.....	.....	162	42.0	58.0	.....	.....
1870	116	127	.....	.....	243	47.7	52.3	.....	.....
1875	227	195	.....	.....	422	53.8	46.2	.....	.....
1880	293	305	.....	.....	598	49.0	51.0	.....	.....
1885	447	566	.....	.....	1,013	44.1	55.9	.....	.....
1890	806	1,072	.....	.....	1,878	42.9	57.1	.....	.....
1896	1,690	1,489	.....	17	3,196	52.9	46.6	.....	0.5
1924	6,900	2,950	.....	.....	9,850	70.0	30.0	.....	.....
1934	NA	NA	NA	NA	10,790	NA	NA	NA	NA
1939	9,336	3,424	.....	.....	12,760	73.2	26.8	.....	.....
1948	11,326	4,992	121	.....	16,439	68.9	30.4	0.7	.....
1958	12,528	4,709	103	468	17,808	70.4	26.4	.6	2.6
1963	13,468	5,501	37	230	19,236	70.0	28.6	.2	1.2

NOTE: There were 14 private waterworks with an unknown date prior to 1890. See text for qualifications of data.
NA=Not available

In 1925 an abbreviated version of this table was included in the manual of "Water Works Practices" published by the American Water Works Association and edited by Abel Wolman (*8*). A footnote points out that, since the table was first compiled, a 17th work had been uncovered. Since the original table has long been publicly cited, there seems little reason to change it now. The 17th item referred to was probably at Shaefferstown, Pa., a private company established "about 1732." The 1896 data shown in table 32 are taken from the last mentioned publication and are presumed to come from a later edition of Baker which is known to have existed.

Aside from the incomplete data of Tarbett, no inventory type data have been located for the period 1896 to 1924, although Alvord (*9*) in 1917 presents data on population served by filtration for 1900, 1904, 1910, and 1914. In 1925, the American Water Works Association (*8*) secured data for the previous year from 40 States and made an estimate for the remainder. Turneaure (*10*) quotes these same figures but attributes them to 1926, and presents uncited data for 1934. The Engineering News-Record (*6*) prepared an abbreviated inventory for 1939 from data supplied by State Sanitary Engineers. The first formal Public Health Service inventory was published in 1948.

Some care must be exercised in making comparisons of numbers from period to period because of definitions. From 1896 back, Baker uses

"works" in his table but textually distinguishes between "works" and "supplies" by saying the latter are for "plants" furnishing water for (human) consumption only, while the former furnished water for both consumption and fire protection, but does not indicate whether there may be more than one in a community. The AWWA (*8*) uses the word "works" for 1924. The table notes, however, indicate that "many privately-owned *works*" serve more than one community, with a maximum of 55 places supplied by one New Jersey "*company* and some *cities* serve outside territory." [Emphasis added.] The ENR data for 1939 have "facilities" in the title but show 12,760 "works" serving 13,293 "communities" through 12,629 "systems." The 1948 PHS data are in terms of communities while the 1958 and 1963 data are for facilities as defined on page 3 of this publication. The 1963 data were not complete as to communities, but the number is estimated to be 20,900.

Table 33 shows the available data on growth in population served by waterworks.

TABLE 33. *Growth in population served by waterworks in the United States*

Year	*Estimated population served*
1880 [1]	11,809,231
1890 [2]	22,678,350
1939 [3]	81,243,480
1948	93,455,135
1958	133,126,310
1963	150,602,164

[1] Turneaure, p. 9 (*10*).
[2] Baker, quoted in *Water Works Practice* p. 6 (*8*).
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